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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Progress in Chemical Engineering

THE annual meetings of the chemical engineers seem to us to improve steadily year by year. It is not so much a specific improvement in this or that detail as a steady and progressive ripening of a sound idea supported by a sound organisation. In many respects the Group and the Institution have set a new standard for the older bodies, and the guests drawn from the latter, who originally went to scoff gently or to administer a paternal pat to Dr. Leinstein's "mixed infant," now remain unreservedly to praise. The explanation is that the chemical engineers represent a united interest; they are a particularly united and loyal body; from the first, whatever they had to do, they decided to do it thoroughly well; their early conferences were models of good organisation, and even their programmes were worth preserving; they have been singularly fortunate both in their honorary officials and in their working staff; there has been perfect and unselfish co-operation in pursuit of a clearly defined aim. Such qualities as these were bound to win success, and they have won it. Some of the older societies may learn, if they have not lost the capacity for learning, much that might

benefit them from the example and work of the chemical engineers.

Every member of the Group and the Institution will endorse the statement that the progress of the past two years owes much to the retiring president, Sir Alexander Gibb. An engineer much more than a chemist, he has been able to look at things from a more detached point of view, yet without any diminution of sympathy with the idea. His two presidential addresses have been worthy of the chair of the oldest and greatest of our scientific institutions. He has brought great energy and experience to work in council, and no president could ever hope to radiate a better or more infectious spirit of good fellowship. Mr. Arthur Reavell, his successor in the presidency, will, we are sure, recognise all this as fully as the rest of the members. But the new president, too, has personal qualities as well as high technical qualifications of his own that will ensure a happy period of office for himself, the support and confidence of the whole membership, and the continued progress of the organisation. He has been in the movement from the beginning, and enters upon his presidential duties with the goodwill of all.

In some ways, the most notable utterances this year were found not in the formal conferences, but rather at the evening dinner—a delightful function, with a distinguished company, yet entirely free from stiffness, and the speaking much above the average. For the last result something is due to Viscount Chelmsford, whose speech in proposing the toast of the Institution not only set a standard for those who followed but furnished the most convincing evidence of the industrial demand for qualified chemical engineers in the chemical, gas, oil, and other industries. "The chemical engineer," he claimed in one comprehensive sentence, "is the one man all the industries to-day are asking for." For that result, the Institution of Chemical Engineers and the Chemical Engineering Group that preceded it may largely claim the credit.

I.C.I.'s Second Successful Year

LAST year, when it was reported that the profit on the first year's operations of Imperial Chemical Industries amounted to 4½ million sterling, the result was regarded as an astonishing success and a convincing evidence of sound management. The report for the second year, now announced, is even better. The profits are £921,018 more than those of last year, and, with the balance carried forward from 1927, the total profit available is £5,570,923. The directors recommend a final dividend on the ordinary shares of 5 per cent., making 8 per cent. for the year, and a dividend on

the deferred shares of 1 $\frac{3}{4}$ per cent. When one considers that these results have been achieved while the processes of co-ordination and concentration have also been proceeding, they appear almost colossal. These processes must continue in operation for some time before so huge an organisation with so many new parts has been welded into the one perfect machine it must ultimately become, free from duplication and waste. But the shareholder who is fortunate enough to have a substantial holding in the company will think not of the present moderate dividends compared with the current market prices of the shares, but of the position that Imperial Chemical Industries will hold, say, five or, still better, ten years hence.

The general impression, in the face of the second year's report, will be one of surprise at the pace at which the great amalgamation is being brought into working order and at the remarkable results achieved in the first two years. An even better idea of the soundness of the company than that supplied by present profits and dividends may be gained from the reserves. After certain appropriations out of the increased value of realised investments, including writing off the whole of the preliminary expenses of £1,260,953, the company's reserves at December 31 last, including the transfers made thereto last year, and share premiums, will exceed £11,000,000, as compared with £700,000 at December 31, 1927. That, perhaps, is the most impressive figure in the whole report.

The Dead Sea Concession

THERE is still some uncertainty about the grant of a concession to work the mineral contents of the Dead Sea, but information, if laboriously, is gradually being extracted from H.M. Ministers on the subject. The questions put in the House of Commons last week elicited the information that at last the Colonial Minister has received the reply of the Trans-Jordan Government and that both they and the Palestine Government have now authorised the conclusion of the draft concession. The Minister hopes to be able at an early date to make a definite offer to the prospective concessionnaires, and if that offer is accepted and other connected matters are satisfactorily arranged, the concession will be signed. All this should be put through before the end of May. Asked by Colonel Howard-Bury whether the concession had been granted in principle to Mr. Novomeysky for two years, Mr. Ormsby-Gore denied this, and said that it had been offered provisionally to Major Tulloch and Mr. Novomeysky in equal shares, and he had no doubt that these gentlemen would be able to raise the necessary finance. When, however, pressed to say whether Major Tulloch had handed over a power of attorney to Mr. Novomeysky, giving him complete control, Mr. Ormsby-Gore asked for notice of the question—which usually means that he cannot answer it or desires time to frame a diplomatic reply.

The object of the question appears to be to secure that Major Tulloch, the British prospective concessionnaire, shall have the full powers of a concessionnaire and not be a mere figurehead, and the House is entitled, of course, before it approves any scheme, to

know the exact position of all the parties concerned. Similarly, one would assume the intention of Parliament to safeguard British interests in any new potash supplies and to see that in the matter of prices consumers are not liable to be exploited. In due course, some light may be thrown on these points—that is, assuming that this long-delayed matter will really be cleared up before the Government go to the country. The matter was further discussed in the House of Lords on Wednesday.

Overseas Chemical Trade

THE Board of Trade Returns for February show a slight all-round shrinkage in overseas chemical trade. There is a decrease in imports of chemicals, drugs, dyes, and colours of £1,302; the exports have declined by £57,772; and the re-exports have declined by £16,144. The comparisons are with the February figures of last year. The most obvious reason for this temporary set-back is the severe weather, which considerably interfered with transport and had a chilling effect on all kinds of operations in more senses than one. The decline is not of very serious proportions, and the record for the first two months of this year, as compared with January and February of 1928, still remains favourable. The chemical imports for this period show an increase of £184,524 and the chemical exports an increase of £98,329.

Books Received

DIRECTORY OF PAPER MAKERS, 1929. London: Marchant Singer and Co. Pp. 276. 5s. 6d.

The Calendar

Mar.		
25	Society of Chemical Industry (Glasgow Section): "The Activity of Various Catalysts in Promoting the Oxidation of Methane by Means of Oxygen." John R. Campbell. "A Simple Method for the Determination of Phosphorus in Coal Ash." W. J. Skilling and E. D. Ballantine. 7.30 p.m.	Royal Technical College, Glasgow.
25	Society of Dyers and Colourists (Manchester Section): "Effect of Light on Coloured Cotton Fabric." Miss E. Hibbert. "The Singeing of Cotton and the Formation of Oxycellulose." G. E. Holden. "The Storage of Steam." Dr. E. G. Ritchie. 7 p.m.	36, George Street, Manchester.
26	Institute of Chemistry (Belfast Section): X-Ray Demonstration. Dr. Allworthy.	Belfast.
27	Society of Chemical Industry (Nottingham Section): "Corrosion." L. O. Newton. 7.30 p.m.	University College, Nottingham.
28	West Cumberland Society of Chemists and Engineers. Annual Meeting. 7 p.m.	Workington.
30	Leicester Literary and Philosophical Society (Chemistry Section): Annual General Meeting. 8 p.m.	Museum, Princess Road, Leicester.
Apr.		
3	Society of Public Analysts: Papers by L. H. Lampitt, E. B. Hughes, H. S. Rooke, J. W. H. Johnson, B. J. F. Dorrington and Dr. A. M. Ward. 8 p.m.	Burlington House, London.
12	Society of Chemical Industry (Manchester Section): Annual General Meeting. "Suggestions in Steam Raising." T. R. Wollaston. 7 p.m.	Engineers' Club, 17, Albert Square, Manchester.
16	Oil and Colour Chemists' Association: Eleventh Annual Dinner. 7 p.m.	Connaught Rooms, Kingsway, London

The Use of the Immersion Refractometer in Milk Analysis

By G. D. Elsdon, B.Sc., F.I.C., and J. R. Stubbs, M.Sc., F.I.C.

Milk analysis, in spite of the large amount of work which has been done on the subject, still offers a wide field for discussion and investigation. In the following article, Messrs. Elsdon and Stubbs present a review of an important aspect of the subject, which should be of great value to all who are concerned with the examination of milk.

THE best instrument for use, both on account of the delicacy of reading (it will detect a difference of 0.1 degree, equivalent to 0.00004 in the refractive index) and the ease of application, is the immersion refractometer as introduced by Zeiss. It was apparently first described in the literature by H. Matthes (*Zeit. für Untersuch. der Nahr. und Genussmittel*, 1902, 5, 1037; *Analyst*, 1903, 28, 91).

The readings of the Zeiss instrument are on an arbitrary scale (-5 to +105), and fractions of a division are ascertained by means of a micrometer screw. A table is supplied for the conversion of the scale reading into refractive index. By means of different prisms a range of refractive index from 1.32539 to 1.49183 can be obtained, with an accuracy of about 2 to 4 in the fifth decimal place. The instrument is supported on a stand, with the prism at the lower end dipping into a small beaker containing the solution to be tested. The beaker is placed in a water bath maintained at a constant temperature and so arranged that white light is reflected through the bottom of the beaker into the instrument.

Temperature of Working

Wagner, in the compilation of his tables, used a temperature of 17.5° C., but this is not an easy temperature to maintain, especially in hot weather, neither is it one which has found general acceptance. Several workers have suggested a temperature of 20° C. as being more easily obtainable under all conditions, and this is now generally adopted. It was recommended by the Refractometry Committee of the London Section of the Society of Chemical Industry (*J. Soc. Chem. Ind.*, 1919, 38, 3997) for general use in non-tropical countries. The regulation of the temperature of the bath is obtained by means of the arrangement of an adjustable head of water, as suggested by Zeiss. Difficulty in securing a uniform temperature caused by variations in the pressure of the gas supply may be obviated by using a gas regulator such as that supplied by Messrs. Griffin and Tatlock (Catalogue No. X3605). By this means it will be found possible to maintain a uniform temperature to within 0.1° C., for as long a period as required.

The refraction of milk serum changes by 0.27 of a division for each degree Centigrade, a higher temperature causing a lower refraction and *vice versa*.

The Accuracy of the Reading

It is quite possible for a series of readings of the same liquid to be taken by one observer with no greater error than 0.05 of a division. To obviate any personal variation due to different methods of setting the instrument, each observer should take the refraction of distilled water at 20° C., which should be 1.45, and make any necessary corrections in all his other readings. In general, a volume of 10 c.c. is a convenient quantity to use, but readings may be taken with as little as 1 c.c. in an open beaker, whilst with the auxiliary prism one or two drops are sufficient.

Much work was done by Dr. B. Wagner, under the auspices of the manufacturers, on the refractions of solutions of different salts of varying strengths, and these are published in book form. The first application of the instrument to milk appears to have been made by H. Matthes and F. Muller (*Zeit. für öffentl. Chem.*, 1903, 9, 173; *Analyst*, 1903, 28, 241). Since then many investigators, more particularly on the Continent and in America, have worked on this subject.

It was hoped that the method might be of particular service in the detection of added water in milk, as it has been suggested that the osmotic pressure of the blood of a healthy cow is fairly constant and that it varies very little from animal to animal. It seems not unnatural to expect that the osmotic pressure of the milk will be either identical with or bear some constant relation to that of the blood, and that therefore all milks should have similar osmotic pressures. These will, of course, depend upon the kind and quantity of dissolved solids, which factors also decide the index of refraction. It would not be surprising, therefore, if the refractions were proportional to the osmotic pressures and therefore approximately the same

for all cows. How far this hope has been fulfilled will be discussed at some length below.

The Preparation of a Serum

In order to determine the refraction of milk by the immersion refractometer, even with the use of the auxiliary prism, it is necessary to prepare a serum. This can be done by filtering the milk through a porcelain filter, but on account of the time taken and the apparatus required, this method is not suitable for routine work where a large number of samples have to be examined. For this reason some chemical method is necessary. A number have been proposed. A short account of the majority of these is given below.

(1) *Copper Sulphate Serum*.—A quantity of milk (usually 20 or 40 c.c.) is treated with one quarter of its volume of a solution of crystallised copper sulphate containing about 71.5 grammes per litre exactly adjusted, if necessary (by the addition of water or copper sulphate), until its refraction is 36.00 at 20° C. The mixture is well shaken and filtered through paper.

(2) *Sour Serum*.—The milk is allowed to become sour spontaneously. The serum is obtained by filtering. This method is not very satisfactory, as various changes take place which influence the refraction and which cannot be controlled.

(3) *Acetic Acid Serum, A.O.A.C. method*.—To 100 c.c. of milk, measured at 20° C. into a beaker, add 2 c.c. of 25 per cent. acetic acid (Sp. Gr. 1.035). Cover the beaker with a watch-glass, and place in a water bath at 70° C. for 20 minutes. Place the beaker in ice-water for ten minutes, and separate the curd from the serum by rapid filtration through a small filter.

(4) *Calcium Chloride Serum*.—Thirty c.c. of milk are thoroughly mixed with 0.25 c.c. of a solution of calcium chloride (Sp. Gr. 1.1375) in a tube, which is then closed by a cork through which is passed a short piece of glass tubing to act as a condenser. The tube is heated in a boiling water bath for 15 minutes and then placed in cold water. Any water condensed in the tubing is added, and the serum decanted.

(5) *Mercuric Chloride Serum*.—The reagent is made by dissolving 125 grammes of mercuric chloride in 75 c.c. of concentrated hydrochloric acid and diluting to 100 c.c. with the same strength acid. A volume of 0.3 c.c., mixed with 30 c.c. of water, should give a refraction of 20.0. The serum is prepared by mixing 30 c.c. of milk with 0.3 c.c. of the reagent. The refractions are usually 3.0 to 3.1 higher than those of calcium chloride sera but less than this in the case of sour milks. (*J.S.C.I.* 1920, 39, 464A, 608A.)

(6) *Carbon Tetrachloride Serum (Analyst, 1912, 37, 450)*.—50 c.c. of milk are shaken with 5 c.c. of carbon tetrachloride for ten minutes, 1 c.c. of 20 per cent. acetic acid is then added, the mixture again shaken, and submitted to centrifugal action.

Of the above methods, those using copper sulphate and mercuric chloride require the least manipulation. The copper sulphate method has been used recently by many workers: it is an official method of the American A.O.A.C., and in general seems to be the most convenient of those in use for routine purposes. It is to be recommended.

Decomposition and Refraction

It has been shown by several workers that the refraction of milk serum obtained by some methods does not remain constant as the milk becomes sour. Thus Mai and Rothenfusser (*Z. Untersuch. Nahr. Genussm.*, 1908, 16, 7) found unreliable results when the acidity of the milk was such that 100 c.c. required more than 9 c.c. of N/4 alkali. Schutz and Wein (*Ibid.*, 1913, 26, 177) state that in the case of the calcium chloride serum the increase in the refractometric value due to the formation of acidity in the milk may be prevented by the addition of a few drops of formaldehyde. J. Pritzker (*J.S.C.I.*, 1918, 37, 780A) noted the same increase, and thought it was due to the solution of calcium phosphate by the lactic acid formed. L. Panchaud and E. Auerbach (*Ibid.*) also noticed the change, and attributed it to the conversion of lactose into lactic acid, which, they say, has a higher refractive index.

L. Bém (World's Dairy Congress, Reading, 1928) found that in six cases out of 72 the refraction had increased in 18 hours after milking by such an amount that would cover from 4 to 11 per cent. of added water. A. More (*Analyst*, 1927, 52, 213) states that the refractometric reading of the copper serum increased with the development of acidity during storage and that a milk which had developed acidity appeared to be of better quality than the milk in its original condition. Elsdon and Stubbs (*Ibid.*) attempted to trace some quantitative relationship between the increase in acidity and the increase in refraction. It soon became evident, however, that there were so many factors to be taken into consideration that it was quite impossible to deduce any general correction by which the refraction of the fresh milk might be found.

J. Hanley (World's Dairy Congress, Reading, 1928) found an appreciable change in the refraction of the acetic acid serum, yet he now apparently denies the logical conclusion to which such an admission must lead.

W. H. Roberts (in a private communication), E. Ackermann (*Annales de Chimie Analytique*, 1927, 22, 152), B. Pfyl and R. Turnau (*Arbeit. Kaiserl. Gesundheitsamte*, 1912, 40, 245), G. Ambühl and H. Weiss (*J.S.C.I.*, 1920, 39, 464A), and Elsdon and Stubbs (*Analyst*, 1927, 52, 193) all agree that, with certain precipitating reagents, as a milk becomes sour the refraction rises.

It follows, therefore, that it is desirable for the refraction to be observed when the milk is as fresh as possible, and that the method may be unreliable in those cases where the acidity of the milk exceeds 2 c.c. of N/10 NaOH for 10 c.c. of milk to phenolphthalein. This is so important that the statement must be emphasised. *Fresh milk is essential.*

The Refraction of Genuine Milk

The figures obtained for the refraction of genuine mixed milks depend to a considerable extent on the method adopted for the preparation of the serum. This is shown in the following table, where average figures due to various observers are given.

Copper Sulphate Serum.	Sour Serum.	Acetic Acid Serum.	Calcium Chloride Serum.	Mercuric Chloride Serum.
37.0-39.0	38.0-40.0	39.0-41.0	37.5-41.0	40.5-44.0

The published figures for several of these precipitants will be considered.

Copper Sulphate Serum

Most of the work with copper sulphate has been done by the American A.O.A.C. (*Methods of Analysis*, 2nd edition, p. 264), J. F. Tocher (*Variations in the Composition of Milk*) and Elsdon and Stubbs (*Analyst*, 1927, 52, 193). Tocher's work was all done on the milk of individual cows, whilst that of the other workers dealt mainly with the mixed milk of herds.

In considering the average figures obtained by various workers it must be remembered that the effect of sourness has not been generally recognised, and that therefore some of the published figures will tend to be somewhat high. This certainly applies to the results on the milks of individual cows obtained by Tocher. The figures obtained on absolutely fresh milks will therefore be on the whole somewhat lower than the published results.

Tocher, in the case of 676 samples of the milk of individual cows, found refractions varying from 32.7 to 40.7, with an average of 38.275, but only ten out of the whole number gave a reading of less than 36.1, and 37 readings less than 36.6. It would appear from Tocher's figures that it is extremely unlikely that a herd of more than five or six cows would give a reading of less than 37 or more than 40, and that as a rule the figures will lie between 37.5 and 39.

The American A.O.A.C. (*Methods of Analysis*, p. 264) state that genuine milk does not give a refraction of less than 36.0, but this must be considered as being too low, and would admit in certain cases of the addition of 15 per cent. of water passing undetected.

The Watering of Milk

Elsdon and Stubbs (*loc. cit.*), on the examination of 1,000 mixed milks, found that the refraction varied from 36.6 to 40.2, with an average of 38.35, and gave as their opinion, which has since been substantiated from the examination of a large number of further samples, that genuine mixed milk will almost always give a refraction of the copper sulphate serum varying between 37 and 39. A milk having a refraction

of less than 37 with a solids-not-fat of less than 8.4 and giving a normal Vieth's ratio is very probably watered. If an "appeal-to-cow" sample taken within three days gives analytical figures all round appreciably higher than those given by the suspected sample, and a normal Vieth's ratio, the probability becomes a certainty.

In coming to a correct conclusion as to the value of the refractometric test and its relationship to the other tests which are usually or frequently employed to decide whether a given milk is or is not watered, many points have to be kept in mind. The suggestion that the osmotic pressure of milk may be a more or less constant quantity, or a quantity varying only within well-defined limits, has already been mentioned. It is reasonable, also, to suppose, although it will be seen below that such a supposition is not in fact correct, that the refraction may have some sort of general relationship with the osmotic pressure.

The refraction of a solution depends upon the kind and quantity of the solids dissolved therein. This is, of course, definitely established, and may be regarded as the starting point of any discussion on the subject. A milk serum contains, besides the precipitating substance, if any be present, lactose and mineral matter and in some cases soluble proteins (mostly albumin). Any precipitating substance present in the case of a fresh milk is almost constant in quantity, so that any variations in the refraction are due to variations in the amount of lactose, soluble proteins and/or mineral matter—just those solutes on which the osmotic pressure of the milk will depend. It is known, however, that the effect of variation in the amount of each of these substances will not affect refraction and osmotic pressure in the same proportion, so that these latter will not vary proportionally to one another.

Variations in Osmotic Pressure

Variations in the osmotic pressure, then, are due to variations in the proportions of lactose, soluble proteins and mineral matter. If, for any reason, any one of these substances is deficient, then in order that the osmotic pressure shall not vary, one or both of the others must be present in greater quantity, and as the effect of one gram of lactose on the osmotic pressure is not the same as the effect of a gram of soluble protein or a gram of mineral matter, the total concentration of the solution will be different from the normal and the ratio of the ingredients to one another will also be different from that usually found. This seems to be the reason why Vieth's ratio is constant for normal milks and dilutions thereof and does not hold for abnormal milks. Therefore, if we find a milk having low solids-not-fat, a normal osmotic pressure (freezing point), and abnormal values for the proportions of lactose, proteins and ash, we may assume that the milk is genuine but abnormal. (As regards proteins, it would be much better to take the proportion of albumin present, as this affects the osmotic pressure slightly, whilst the casein does not do so appreciably, but there is no convenient routine method for the determination of albumin.)

It might be assumed that as the variations in the constituents of an abnormal milk tend to keep the osmotic pressure constant they will have the same effect on the refraction. That this is not the case is explained by the fact that the effect of lactose on the refraction is greater than that of an equal concentration of the other ingredients, and as in an abnormal milk it is usually the lactose that is deficient we usually have a low refraction with a low solids-not-fat. This is particularly noticeable in the work of Tocher, who found a refraction (copper serum) of 32.75 with a low solids-not-fat. Similar results have been found by Elsdon and Stubbs. Tocher found that both albumin and ash decrease as the lactose increases and that Vieth's ratio only holds good for milks of average composition.

The conclusion to which one is forced not only from theoretical considerations but also from the results which have been obtained by all those who have worked on the subject is that, apart from gross adulteration, the refraction cannot of itself distinguish between a watered and an unwatered milk. It is extremely unlikely that a fresh mixed milk having a refraction of less than 37 (copper serum) will be genuine—in fact, Elsdon and Stubbs have only come across one or two such samples during the examination of about 2,000 mixed milks—but the refractometer offers no assistance in deciding whether a milk having a solids-not-fat of, say, 8.2, is genuine

or abnormal, as the refraction is almost always more or less proportional to the solids-not-fat.

Sour Serum

The method of obtaining a serum by spontaneous souring has the obvious advantage that no foreign material need be added to the milk, but sufficient work does not appear to have been done to ascertain its true value. The writers are at present engaged in its investigation.

The method has been used by some workers. Matthes and Muller (*Analyst*, 1903, 28, 241) state that the sour serum should have a refraction of at least 39.75 at 20° (40.0 at 17.5° C.). The American A.O.A.C. state that the figure should be not less than 38.3.

Acetic Acid Serum

The disadvantage of the acetic acid serum method is that the precipitated milk must be heated and then cooled. It does not appear to have any compensating advantages. The fact that the solution is heated to 70° C. will probably result in precipitation of at least a portion of the albumin, which, in view of the suggestion made above under "Variations in Osmotic Pressure," may not be an advantage.

Leach and Lythgoe (*Analyst*, 1905, 30, 57) state that the refraction of the acetic acid serum should be not less than 39 at 20° C., and in *Food Inspection and Analysis* give figures varying from 39.0 to 45.0, with one sample of 34.7, and the same figures are given by J. McCrae (*Analyst*, 1914, 39, 212). The American A.O.A.C. gives 39 as the lowest figure for a genuine milk, and figures between 39 and 40 as suspicious.

Calcium Chloride Serum

The objection of the increased amount of manipulation needed with the calcium chloride serum method is similar to that mentioned under acetic acid serum.

A considerable number of workers have used this method with fairly concordant results. Thus E. Ackermann (*Analyst*, 1907, 32, 117) found the refraction of genuine milks to vary from 38.25-40.25 (corrected from 17.5° to 20.0° C.). C. Mai and S. Rothenfusser (*Analyst*, 1908, 33, 400; 1910, 35, 126) found figures varying from 38.0 to 41.2 (average 38.5), and also that samples from the same cows on several successive days and over a period of eleven to fifty days showed no greater variation than 0.6 of a division. In two cases of diseased udders the figures were 36.6 and 37.0, with corresponding solids-not-fat of 8.05 and 8.63 respectively. G. Fendler, G. Borkel and W. Reidmeister (*Analyst*, 1910, 35, 441) found figures between 36.5 and 40.0, and suggested 37.0 as a minimum limit. These writers consider that there is not much relationship between solids-not-fat and refraction.

R. Windisch (*Analyst*, 1914, 39, 256) found figures usually between 38.5 and 39.5. His range was about 37.5-40.7, and he found that the refraction tended to rise towards the end of the lactation period. G. Wilhelm (*Analyst*, 1917, 42, 328) gives the minimum figure as 37.5. K. Alpers (*Analyst*, 1912, 37, 317) gives 35.3 to 40.8 as the limits for individual cows, the average being 38.6. G. Wilhelm (*Analyst*, 1917, 42, 328) gives 37.5 as the minimum figures for genuine milks.

From the above figures it will be seen that it is generally agreed that genuine milks do not usually have refractions below 37.5, and that they usually vary between 38.0 and 40.0. The fact that figures between 36.6 and 41.2 have been found shows that there is no advantage from this point of view in this method of precipitation over the others. It would be possible to add nearly 20 per cent. of water to a milk having a refraction of 41.2 before this was reduced to 36.6.

The Value of the Refractometric Test

It must be admitted by every unprejudiced worker on this subject that the refractometric test has not fulfilled the early anticipation entertained, or substantiated the claims made for it in certain quarters.

The statement has been made that an unwatered milk naturally low in solids-not-fat will, in general, have a normal refraction, whilst a watered milk of the same composition will have a low refraction. This is not true. There may, of course, be no direct mathematical relationship between the refraction and the solids-not-fat, but the work of Tocher, Monier-Williams, McCrae, Elsdon and Stubbs and others has shown that when the solids-not-fat are high, a high refraction is to be expected, and when the solids-not-fat are low, from whatever cause, a low refraction is to be expected. A milk

having solids-not-fat of less than 8.4 per cent. will almost always have a refraction of less than 37.0 with copper serum at 20° C.

J. Hanley (World's Dairy Congress, Reading, 1928) appears to claim to have found a considerable number of genuine milks of the type solids-not-fat 8.2 per cent. and 38.5 refraction. He is the only observer who has found milks of this character. On practical or theoretical grounds such figures would appear to be impossible. Elsdon and Stubbs (*Ibid.*) attempt to explain them in the following way: For example, a genuine fresh milk having 8.5 per cent. of solids-not-fat usually has a refraction of about 37.0. When such a milk becomes slightly sour it will soon reach a point where the solids-not-fat have fallen to, say, 8.2 per cent., whilst the refraction will have risen to about 38.5. Then, if this milk be examined, it will appear that a refraction of 38.5 corresponds with a solids-not-fat of 8.2, whereas in the original milk the figures are respectively 37.0 and 8.5, and these latter are, of course, the only figures which can be used legitimately to determine the genuineness of the milk.

The writers are quite satisfied, and their conclusions are endorsed by every other worker on the subject, save one, that the refractometer will not, of itself, decide between a poor milk and a watered milk of the same composition, since in general the refractions will be of the same order.

When we examine the range of figures obtained by the refractometer we find that this is very wide, as wide, in fact, as that of the solids-not-fat. Thus Tocher, for individual cows, found the solids-not-fat to vary from 7.5 (one sample was 7.0) to 10.6 per cent., a variation of 29 per cent. of the higher figure, and the refraction to vary from 34.8 (one figure was as low as 32.75) to 40.7, or a variation of 27 per cent. of the difference between the higher refraction and that of a mixture of four parts of water and one of copper sulphate solution. Elsdon and Stubbs (*loc. cit.*) found the solids-not-fat to vary 13 per cent., whilst the corresponding refractions varied 17 per cent. Hanley (*loc. cit.*) considers that the refraction is much the more valuable, but produces no figures which substantiate this opinion.

To sum up, therefore, we can say that the refraction of genuine milks will vary, using copper sulphate serum at 20° C., between 37 and 39. An occasional sample will be found less than 37, when, if the solids-not-fat are low, this may be due to deficiency in lactose in an abnormal milk or to added water. This latter point can be decided by a determination of albumin and ash (particularly the chlorine, which should be high in the case of a genuine milk having low solids-not-fat), and by the taking of an appeal-to-cow sample.

Research Work on Bleaching

DR. R. G. FARGHER, of the Shirley Institute, discussed the question of research work on bleaching at a meeting in Manchester on Saturday of the Association of Managers of Textile Works. Until the last few years, he said, little information was available as to the extent to which substances other than cellulose were present in unbleached cotton. They actually formed a not inconsiderable portion of the material, usually from 6 to 10 per cent. of the whole. Of the cottons commonly used in Lancashire, American contained the least and native Indian the most non-cellulose material. In addition to this, in the bleaching of cloth the ingredients used in the sizing of the warp had to be removed. On the average, therefore the bleacher has to remove from 6 to 9 per cent. of material present initially in the cotton and an amount of size which generally varies from 4 to 8 per cent. of the weight of the cloth. By efficient desizing, virtually the whole of the size, other than the fat, and from 2 to 3 per cent. of the cotton impurities can be removed, leaving, therefore, less than half the initial impurities to be eliminated during subsequent bleaching. Complete desizing may therefore be expected to lead to a cleaner and more level scoured cloth. The methods of desizing most generally favoured are (a) by means of malt and other diastases, and (b) by means of acids. The diastases used in the industry include malt and pancreatic preparations and others obtained by the growth of bacteria or mould fungi on suitable media. To get the best results it is necessary to know and to ensure the temperature of reaction at which each is most active and their stability.

Annual Meeting of Institution of Chemical Engineers

Mr. J. Arthur Reavell Elected President

The annual corporate meeting and annual dinner of the Institution of Chemical Engineers took place at Grosvenor House, Park Lane, London, on Wednesday. The address of the retiring President, Sir Alexander Gibb, dealt with "The Co-ordination of Engineering Institutions and Societies," and will be published in our next issue. Below are given the report of the council, the results of the election of officers, and the paper read in the afternoon by Professor P. B. Haigh.

The Council's Annual Report

THE Council records a continuance of the expansion of the Institution, as shown by the following figures:—

	1927.		1928.		Increase.
Hon. Members ..	7	..	9	..	2
Members	214	..	246	..	32
Associate-Members	168	..	192	..	24
Graduates	61	..	72	..	11
Students	14	..	16	..	2
	464		535		71

During the year, honorary membership of the Institution was conferred on Dr. E. R. Weidlein, President, and Dr. Charles L. Reese, Past President, of the American Institute of Chemical Engineers, in connection with the visit of the Institution to Canada and the United States.

With a growing membership and increasing activities, the gross income in 1928 from all sources amounted to £2,291 1s. 10d., an increase of £81 7s. 7d. over the income for the previous year. Abnormal expenditure in connection with the official visit of the Institution to Canada and the United States during the year has resulted in an adverse balance of £67 8s. 3d. In view, however, of the special nature of the circumstances, this result gives no cause for alarm, as in all other respects the pre-arranged budget has been more than realised. The financial position of the Institution is now thoroughly sound and its income well able to meet its normal demands.

The Council has continued to emphasise the need for fundamental education in chemical engineering in universities and colleges. The Council welcomes the announcement of courses in chemical engineering which have been arranged at King's College of the London University. The direction of the course, the lectures and laboratory work of a purely chemical engineering character will be undertaken by Mr. H. W. Cremer, M.Sc., M.I.Chem.E. As a result of the Institution's efforts, additional classes are being organised by the London County Council at the Hackney Institute. The new classes are in the charge of Mr. A. J. V. Underwood, M.Sc., A.M.I.Chem.E. It is also a pleasure to record the granting of the first degree of B.Sc. in Chemical Engineering in the University of Glasgow. The first recipient of the degree (with honours) is the son of a member of the Institution. A further development of importance is the award, for the first time, of the degree of M.Sc. of London University in Chemical Engineering. Amongst the successful candidates were four graduates of the Institution. The third examination for admission to the Associate-Membership was held during the year. Of five candidates originally entered, ill-health prevented three from taking the examination. Of the remaining two, one candidate satisfied the examiners. The Council records its indebtedness to the examiners for their careful work in organising and carrying out the examination.

Unfortunate circumstances delayed the issue of the fifth volume of Transactions, but this has now been published. During the year steady, if slow, progress has been made with the library, the use of which is developing every month. The reference bureau has also been consulted on several occasions. The thanks of the Council are given to the hon. editor, Mr. S. G. M. Ure, and to the hon. librarian, Mr. T. Campbell Finlayson, for their services during the year.

Under the guidance of its hon. director, Mr. H. J. Pooley, the appointments bureau has had a particularly successful year, for in addition to a number of junior posts, some of a very important character have been filled from the membership of the Institution. The care that is taken to offer suitable candidates only is very much appreciated by employers. The growing demand for chemical engineers is evidenced by the difficulty of filling the large number of junior posts available.

The first award of the Osborne Reynolds Medal (for 1928) has been made to Sir Alexander Gibb, in recognition of his

very great services to the Institution during his term as President.

The Council has accepted an invitation to participate in the World Engineering Congress to be held in Tokyo in October next. Sir Alexander Gibb has kindly consented to head the delegation from the Institution, and a number of papers will be presented.

The Council places on record its appreciation of the work of the assistant secretary and his staff.

Election of Officers

At the annual business meeting held in the morning, the results of the election of honorary officers and members of council were declared as follows:—President, Mr. J. Arthur Reavell; vice-presidents, Mr. C. S. Garland and Mr. F. Heron Rogers; honorary secretary, Professor J. W. Hinchley; honorary treasurer, Mr. F. A. Greene; elected members of council, Mr. W. A. S. Calder, Professor W. E. Gibbs, Mr. W. Macnab, and Mr. P. Parrish; Associate Member of council, Mr. J. C. White.

Chemical Action and Metallic Fatigue

In the afternoon, Professor P. B. Haigh read a paper on "Chemical Action in Relation to Fatigue in Metals."

It was well known, said Professor Haigh, that metal parts of structures and machines were liable to fracture in service after repeated application or reversal of moderate loads—often much smaller than had been applied in static tests or in brief overload or overspeed runs. Such fractures exhibited a characteristically brittle appearance, as if the metal were unable to avail itself of whatever ductility it might show in ordinary tensile, bending or other mechanical tests.

Mechanical fatigue might be defined as a change that occurred in metals during off-repeated application or reversal or other change of stress, and resulted eventually in the formation of cracks when the range of stress was sufficient.

Definition of Endurance and Fatigue Limit

In laboratory fatigue tests, the stress on the metal was varied in cycles, the same range of stress being repeated in each successive cycle. Millions of cycles might be required before the fracture appeared visible on the surface, but its first appearance was quickly followed by fracture. The "endurance" of the test-piece—under the particular range of stress employed in the particular test—was defined as the number of stress cycles required to cause fracture.

When successive test-pieces were tested with different ranges of stress the endurance was found to increase rapidly when the range of stress was reduced towards an ascertainable limiting value—below which the metal appeared to be immune against fatigue. The "fatigue limit" was defined as the limiting stress that could be reversed continually without eventually causing fracture: or, when the cycle was such that the stress varied between unequal extreme values, the definition might be modified to read "half the limiting range of stress."

Reduction of Fatigue Limits by Chemical Reagents

The process of fatigue was long regarded as wholly "mechanical" in nature; but in 1917 the present author showed that the endurance and fatigue limits of metals were often reduced when chemical reagents—even ordinary water—acted on the surfaces of test-pieces during the tests. A notable feature of this phenomenon was the importance of the simultaneous action of the chemical reagent and the cyclic stress. It was shown conclusively that equally destructive results were not produced when comparable degrees of corrosion—judged by appearance or by time of action—were produced prior to an ordinary fatigue test. It was found also, that "ordinary" fatigue tests, in air, were sometimes influenced by the chemical action of the atmosphere.

The lesson of practical experience was clear and striking. Alternating stress was more liable to provoke fatigue when

chemical reagents were in contact with steel, or were blown against it, even though no appearance of corrosion might be observed. This conclusion was endorsed by general experience in other directions. The motor chassis that was well painted and well greased where it was exposed to splash was not only protected against corrosion and wear, but was better able to resist fatigue. It was less likely to crack suddenly.

Recent Research

During the past five years, much experimental research on chemical action in relation to fatigue had been carried out in Great Britain and in America—particularly by Dr. D. J. MacAdam, Jr., of the U.S. Naval Experiments Station at Annapolis.

The different groups had approached the subject by different ways: Whereas Dr. MacAdam had tested a wide variety of metals with the same reagents—fresh and salt water—the British groups had studied fewer metals with a wider variety of reagents directed chiefly to a study of the action of atmospheric air as a reagent in "ordinary" fatigue tests.

In Dr. MacAdam's experiments, jets of fresh or salt water were played on Woehler rotating pieces, the jets being directed so as to wrap themselves round the pieces and cover the section at which fatigue would eventually result in fracture. The chemical action of the water reduced the fatigue limit from 27 to 15 tons per sq. in.². In other examples even greater differences of fatigue limit were recorded, up to ratios of even 9 to 1.

One of the more striking of Dr. MacAdam's conclusions is expressed in the quotation which follows: "For all the carbon and alloy steels" (excluding certain chrome steels mentioned later) "the observed corrosion-fatigue limits vary from 12,000 to 22,000 lbs. per sq. in. Yet, for these steels, the maximum tensile strength is more than five times the minimum, and the maximum endurance limit is more than four times the minimum." In such circumstances, now definitely established by Dr. MacAdam's tests, it was not surprising that the present author, in 1917, reached the practical conclusion that fatigue in wire ropes vibrating under water could not be overcome by the use of other qualities of steel, but must be eliminated by the exclusion of the water by a protective coating.

Accelerated Corrosion

The impression that the combined action was an accelerated form of corrosion, rather than an accelerated form of fatigue—superficial in character and directly dependent on pitting—had led several critics to suggest that it might be found to be less important in large objects than in small test-pieces. There appeared to be no foundation for this hope; but the suggestion had been put to the test. In experiments carried out on a hard steel containing 0.39 per cent. carbon, 1.67 per cent. nickel and 0.82 per cent. chromium—a metal in which the fatigue limit in water was only a quarter of its value in air—Dr. MacAdam had recently found that the fatigue limit in water was independent of the diameter of the test-piece in sizes ranging from 0.5 in. to 2.3 in. diameter. There appeared therefore no reason to doubt that the value of the fatigue limit in water was as definite as its value in air, and was a real property of the metal.

In recent years the term "corrosion-fatigue" had come into general use as a description of the conjoint chemical and mechanical action, but the term appeared ill-chosen and quite misleading. The present author inclined strongly to the view that air was the prime cause of the action in many cases, although not necessarily in all.

In the discussion that followed the present author's original paper in 1917, and particularly the statement that "ordinary" fatigue test-pieces—tested in air—occasionally show evidence that the atmosphere could play the part of a chemical reagent, accelerating fatigue and reducing the fatigue limit, an interesting suggestion was advanced by Dr. Rosenhain—that a layer of oil or grease on the surface of a piece tested in air might suffice to exclude the atmosphere and might thereby retard or prevent the action in question. In other words, a coating of grease in air might play the same part as a coating of zinc on paravane wires under water.

The suggestion was put to the test. Samples of different metals which showed discoloured fractures when tested in air were tested with coatings of grease, vaseline, glycerine, etc., and in baths of paraffin and other liquids that seemed likely to exclude air. It was found that the fatigue limits could be

greatly increased in this way—in ratios as much as 2 to 1 or more in some instances. Immersion in an oil bath was found to be the most effective protection. But even a thin layer of glycerine sufficed in some cases to delay the fracture considerably. In other metals, whose fractures showed no discoloration in ordinary fatigue tests in air, the application of the impervious coating produced no corresponding increase of endurance or strength.

Discoloration of Fractures

The distribution of the discoloration across the face of the fatigue fracture repaid examination. The distribution varied considerably in different metals. In some metals the discoloration terminated suddenly at a well-marked line, and the rest of the fracture was found untarnished. This type of distribution suggested to the eye that fatigue had occurred in two distinct ways in the discoloured and in the uncoloured zones; but except in the matter of colour the appearances were quite alike. In other metals, and more commonly, the discoloration faded gradually across the face of the fracture. It was deepest in the small area that was readily recognised as the "source" of the fracture, and was imperceptible in the final stage of the crack, where the process of "cracking" gradually changed to plastic "tearing."

In most metals that showed the discoloration in question, the appearance varied with the range of stress used in making the test. If the stress was only just sufficient to produce fracture after long endurance, the colour was deeper and extended further than if the piece was broken quickly with a higher range of stress. As the actual range of stress in the cracked piece must increase rapidly as the crack advanced through the section, it appeared as if the process of cracking began with one in which chemical action accelerated the effect of a small range, and finished with a modified process in which purely mechanical fatigue continued under a higher range without waiting for chemical action.

Internal Cracking

Professor Haigh then described experiments leading to the conclusion that, in fatigue tests, the piece broke internally before the crack appeared on the surface. This conclusion appeared to be important. It indicated that the chemical reagents made their way through the metal and accomplished their harmful action deep within the metal, not merely through pitting at the surface. The face of the broken fatigue piece also showed that the crack originated within the metal and not exactly at the surface. The face showed characteristic markings, and the "source" of the crack could always be distinguished. The "source" was found close to, but never quite at, the surface. Between the source and the surface there was always a narrow rim of metal that had failed in a distinctly different way—by shearing or otherwise—but not by the same process that formed the characteristic fatigue "crack."

Chemical Action and the Theory of Fatigue

So long as mechanical fatigue was attributed to gliding of the kind that produced plastic strain, the influence of chemical action upon fatigue appeared inexplicable. It was impossible to fancy that chemical reagents acted as lubricants on the planes of gliding, facilitating slip. These considerations, some years ago, forced the author to set aside the older theory that fatigue was directly associated with plastic slip, and to study other evidence of its action.

When fatigue was attributed to fluid tension, induced locally by contractions associated with changes of state from a metastable to some more stable form, the possibility of chemical influence was immediately evident. It was well known that gases and foreign reagents could penetrate metals, particularly through the films of amorphous metal between the grains; and it was reasonable to assume that the conditions of stress required to provoke changes from the metastable to a more stable state would depend on the chemical character of the amorphous films in contact with the crystalline grains. Not only would the range of stress required vary with the degree of saturation of the amorphous films, but the identity of the more stable state formed would often depend on the identity of the chemical reagent that was present. It was not surprising, therefore, that the face of the fracture should be found discoloured when chemical action had influenced the course of fatigue.

The Study of Oils

Two Papers Before the Oil and Colour Chemists' Association

At the March meeting of the Oil and Colour Chemists' Association, held on Thursday, March 14, at the Institute of Chemistry, London, two interesting papers were read and discussed. Mr. Noel Heaton presided.

DR. R. S. MORRELL and Mr. S. MARKS, in a paper on "The Drying of Vegetable Oils," discussed a chemical investigation on a drying oil system of known composition so as to identify the dominant group factors and to connect them with the problems of gelation.

It was extraordinary, said the authors, that in the important paint and varnish industry there was yet so much uncertainty as to the changes which occurred when a drying oil set to a solid gel. From a chemical standpoint, the first change was the formation of a peroxide; qualitatively this was easy to establish, but quantitatively it was more difficult. At each active double linkage in the long drying-oil chain a peroxide group was assumed. Had these peroxide groupings the same activity? It was admitted that the peroxide stage was temporary and that rearrangements were possible, so that a great variety of oxidation products might appear, according to the conditions of the system. If this great variety of oxidation products be admitted, it seemed hopeless to attempt chemical investigation on the drying of linseed oil with its isomers of linolenic and linolic acids, together with oleic and small quantities of saturated acids.

Tendency of Recent Publications

From a brief summary of recent literature the evidence was in favour of the view that oxidation was followed by polymerisation and gelation. How far these changes could be followed by chemical investigation depended essentially on the purity and identity of the initial substance and especially in the use of pure reagents, because no crystalline or volatile products were obtainable without destruction of the long carbon chain. Even if the identification of definite groups could be established, and this seemed feasible, and also if evidence of polymerisation could be established, the problem of gelation still remained. It was at the stage of polymerisation that purely chemical investigation stopped. It might be that gelation was favoured by the presence of certain groups in the oxidised complex, and it might be that the factors which encouraged the permanence of such groups would facilitate gelation. The problem then passed into the domain of colloid-chemical investigation.

Oxidation of an Isomer of Tung Oil

The results of an investigation of the chemical properties of the oxidation products from an isomer of tung oil (β -elaeostearic glyceride) were given. The oxidation of the glyceride had been studied under varying conditions of temperature, and the results varied considerably owing to the partial decomposition of the oxidation product.

The authors then dealt with the problem of the yellowing of linseed oil films in the dark, and recalled a statement in a paper they had read before the Association in 1927 that the presence of hydroxyl groups was the cause of the yellowing of all drying oil films. A sample of oxidised gel left under dry ether in the light was unchanged after six months, whereas a sample under dry ether in the dark dissolved almost completely to give a dark brown solution. The examination of such compounds was still under investigation.

The Solid Gel

The solid gel had been methylated and found to yield a polymerised peroxy-dihydroxy-methyl ester with a peroxy hydroxy-methoxy-methyl ester of simple molecular weight. This proved that the polymerisation in the gel was of an intra-molecular character. The intra-molecular polymerisation was definitely associated with the modified peroxide group contiguous to the glyceryl radicle. There was indication of a difference in the behaviour of the peroxide groups in the gel. One group was definitely acidic, passing to $-C(OH)=C(OH)-$ form, and was the cause of the yellowing of drying oils. The other group had indications of basic properties and was much less stable, gradually disappearing with time. The initial gelation probably was connected with the functions of this peroxide group, but direct proof must await further

investigation of the peroxide group remote from the glyceryl radicle.

In addition to the gel there was a soluble oxidation product which could be separated by light petroleum. On methylation it yielded products similar to those obtained from the gel, but without peroxide properties and of a simpler character than in the case of the polymerised variety, which, however, attained in time the complexity of the methyl ester produced from the gel. Here there was evidence of the existence of hydroxyl and CO groups. In both cases, from the gel and the soluble oxidation product, there was a persistence of the unsaturated character, as shown by the iodine values, which might have its origin in the dormant double linkage of the three double linkages presumed to be present in the original glyceride.

Whiting and Linseed Oil

In a paper entitled "A Study of Whiting and Linseed Oil," Mr. R. G. BROWNING gave particulars of an investigation which was undertaken to ascertain the cause of discoloration sometimes occurring when linseed oil was mixed intimately with whiting. Artificial whittings were made from pure reagents, so that the impurities could be accurately controlled. After a few preliminary experiments, a series of pastes was made, using increasing proportions of calcium oxide. Each sample was divided into three portions, which were simultaneously exposed to the air in (a) ultra-violet light; (b) daylight; and (c) darkness. Their colour changes were periodically recorded by means of a Lovibond tintometer. From these results it was concluded that the amount of free lime in a specimen of whiting had little influence upon the rapidity of its discoloration in linseed oil. Further, the work confirmed that of J. Twiss in 1918, showing that light was not essential for the drying and accompanying yellowing of linseed oil. Also it was concluded that one hour under the standard form of mercury arc was equivalent to about two days of winter daylight.

Analysis of a whiting showing the discolouring effect revealed iron equivalent to 0.15 per cent. (Fe_2O_3). In view of the known tendency of iron in small quantities to exert comparatively large discolouring effects, its addition to the artificial whiting was tried. Carefully dried hydrated hydroxide was added to further samples before rubbing into the oil. In each case the discoloration was immediate and too rapid to be followed in the tintometer. Exactly similar pastes in a dammar varnish (equal in colour to the oil used) showed no darkening. Therefore, it was concluded that the discoloration was due to the presence of iron in an active condition.

Inquest on Chemical Worker

At the inquest at Huddersfield on Thursday, March 14, on Charles Herbert Strickland (49), a foreman of the dinitrobenzene plant at the works of the British Dyestuffs Corporation, Huddersfield, who died in the Royal Infirmary, it was stated that a post-mortem examination revealed the cause of death to be pneumonia. The condition of the liver, however, led the coroner to order an examination and analysis to be made. Evidence was given that the dinitrobenzene was transferred from casks to reducing pans under the direction of Strickland, but that he did not handle it, and that there were practically no chances of his absorbing the substance. Dr. Guest, pathologist at the Royal Infirmary, said Strickland might have lived for some time but for liver trouble. The condition of the liver might be associated with chemical poisoning, or with some form of septic poisoning not due to chemicals. The coroner said that the analyst's report was that there was no trace of dinitrobenzene or its derivatives in the liver. Henry Foster, chemist in charge of the plant, said that the bulk of the dinitrobenzene was never dry. Occasionally there were fumes from the process. The jury found that Strickland died from pneumonia, and that there was no evidence to show the cause of the liver condition.

Dead Sea Concession

Draft Settlement at Last Authorised

IN the House of Commons on Monday, Lieut.-Colonel Howard-Bury (U., Chelmsford) asked the Colonial Secretary whether, in view of the need of cheap potash for British agriculture, and the necessity of this country to be free of the German potash monopoly, the question of the Dead Sea concession would be settled before the end of May. Further, whether the right hon. gentleman had now heard from the Transjordanian Government with regard to the Dead Sea concessions, and was in a position to make a statement to the House regarding their views?

Mr. Ormsby-Gore (Under-Secretary for the Colonies), who replied, said that as Mr. Amery had stated on February 7 last, he had now received the reply of the Transjordanian Government. Both that Government and the Palestine Government had now authorised the conclusion of a draft settlement. Mr. Amery hoped to be in a position to make a definite offer to the prospective concessionaires at an early date. If accepted, and if other matters were satisfactorily arranged, the concession would be duly signed, which he hoped would certainly take place before the date mentioned in the question.

Lieut.-Colonel Howard-Bury: Are you aware that this concession has been granted in principle to Mr. Novomeysky for two years, and if he has not got the requisite financial arrangements, surely cannot the right hon. gentleman give this concession to those who are prepared to work it and have the necessary financial backing?

Mr. Ormsby-Gore: No, sir; the concession has not been granted to Mr. Novomeysky. It has been offered provisionally to Major Tulloch and to Mr. Novomeysky in equal shares, and we have no reason to doubt that these two gentlemen can raise the necessary finance.

Lieut.-Colonel Howard-Bury: Is it not a fact that Major Tulloch has given power of attorney to Mr. Novomeysky giving him complete control?

Mr. Ormsby-Gore: I should like notice of that question.

Major Crawford (L., Walthamstow, W.): As to the necessity of this country to be free of the German potash monopoly, is it not a fact that what is known as the French group—about which Lieut.-Colonel Howard-Bury has interested himself before in this House—have made arrangements with the German potash monopoly for the European markets?

Mr. Ormsby-Gore: I should like notice of that. As the hon. member knows, the whole arrangement in connection with the sale of potash throughout the world is extraordinarily complex and involves complicated financial arrangements.

Captain Cazalet (U., Chippenham) asked the Under-Secretary for the Colonies whether the final agreements now being considered by the Palestinian Government in regard to the Dead Sea concessions contained provisions to ensure permanent British control and the avoidance of a monopoly control by any group or organisation interested in the production or sale of potash.

Mr. Ormsby-Gore: In view of the terms of the mandate, my right hon. friend does not think it would be practicable to enact such provisions as indicated in the first part of the question. As regards the second part, any concession granted will provide that the operating companies shall not, without the previous written consent of the Palestine and Transjordanian Governments, enter into any arrangement for the restriction of output of potash or the raising or keeping up of prices in such a manner as to restrict output.

Viscount Templetown's Motion in the Lords

IN the House of Lords on Wednesday, Viscount Templetown had a motion on the paper asking for a permanent British control to be established on the Dead Sea, and the subsidiary industries arising therefrom, and that any group to whom the concession for working mineral deposits was granted should be required to have British finance and British control and have no connection, direct or indirect, with the German potash monopoly.

Lord Danesfort maintained that it was important that these deposits of potash and other chemicals should not fall into monopolistic hands.

Lord Melchett criticised noble lords who "greatly exaggerated the position." He deprecated the idea that there was any great prospect of fortunes from the Dead Sea de-

posits. Potash, as a matter of fact, was a mineral of which there was a large amount in the world. The German potash production to-day was about 50 per cent. of their real capacity, while in France and Spain there were large deposits. It seemed to him curious that they had heard a great deal about this concession and yet not one important group of financiers had thought it worth while to make a tender for the concession.

Lord Thomson severely criticised the Government for their delay in this matter. "I doubt," he said, "whether there has ever been a parallel case of delay, except perhaps the case of Lot's wife, who was turned into a pillar of potash for very much the same kind of conduct."

The Earl of Plymouth, replying for the Government, said they could not accept the motion, which would be contrary to the terms of the mandates under which they held the territories of Palestine and Transjordan between which the Dead Sea was situated. They were bound to exercise no discrimination in respect to matters of commerce and industry. The Governments of Palestine and Transjordan were committed in principle to the grant of a concession to Major Tulloch and Mr. Novomeysky based on an offer made by them at the end of 1926. Negotiations with regard to the terms and conditions and the provision of satisfactory financial guarantees were now approaching a conclusion.

Lord Templetown withdrew his motion.

Government and Dye Industry

SIR PHILIP CUNLIFFE-LISTER (President of the Board of Trade), replying to Mr. T. Shaw (House of Commons, March 19), said the total amount granted or taken up by the Government as capital for the development of dyestuff production in this country between 1914 and 1924 was £2,005,751, of which £1,700,001 had been invested in the British Dyestuffs Corporation. The Government holdings in the British Dyestuffs Corporation were disposed of in 1926 for £600,000. As to whether a combination had been reached between German and British dyestuff producers delimiting the areas of sale, arranging certain quota quantities, or regulating prices, he was not aware of any combination or agreement between German and British dyestuff producers.

Mr. P. Harris: If there was such an agreement, would the Government be prepared to reconsider their position in reference to the protection of the dyestuffs industry?

Sir Philip Cunliffe-Lister: That is a very hypothetical question which, there being no such arrangement, obviously does not arise.

The Optical Society

New Officers for 1929-30

THE annual general meeting of the Optical Society was held on Thursday, March 13. Votes of thanks to the Governors of the Imperial College of Science and Technology and Professor Callender for granting facilities to the Society for holding their meetings at the Imperial College, to the retiring Council, and to the hon. auditors were carried unanimously.

The officers and members of Council for the Session 1929-30 were elected as follows:—

President: F. Twyman.

Vice-Presidents: D. Baxandall, J. Guild, Professor A. F. C. Pollard, and F. C. Watts.

Hon. Treasurer: Major E. O. Henrici.

Hon. Secretaries: W. B. Coutts (Military College of Science, Woolwich), and A. A. Whitwell (82, Marryat Road, Wimbledon, London).

Assistant Secretary: T. Martin, (1, Lowther Gardens, Exhibition Road, South Kensington, London).

Hon. Librarian: J. H. Sutcliffe.

Editor of Transactions: Dr. John S. Anderson.

Council: O. Aves, T. Chaundy, C. V. Drysdale, E. F. Fincham, W. Gamble, E. T. Hanson, J. W. Hasselkus, R. Kingslake, Inst.-Comdr. N. M. S. Langlands, Professor A. O. Rankine, J. Rheinberg, R. S. Whipple.

At the ordinary meeting which followed two papers were read and discussed. Mr. W. D. Wright dealt with "A Redetermination of the Trichromatic Coefficients of the Spectral Colours." The points discussed included the technique of colour matching and the range of intensity over which matches remained valid. Dr. J. S. Anderson's paper was entitled "On the Testing of a Novel Photographic Shutter."

Oil, Colour and Chemical Exhibition

A Successful Week

THE International Oil, Colour and Chemical Trades Exhibition, at the Royal Agricultural Hall, London, organised by International Trade Exhibitions, Ltd., closed to-day (Saturday), after a very successful week. In the last issue of THE CHEMICAL AGE, notes were given on some of the exhibits, which are supplemented below.

Mixers, Mills, etc.

Barker and Aspey, of Wilmington Engineering Works, Hull, showed a 20-gallon "Planet" mixer, with portable containers; 30-gallon and 12-gallon "Acme" liquid paint mixers; an "Acme" 20 in. water-cooled cone mill twin; 40- and 20-gallon steam-heated kettles with mechanical stirrers.

Centrifugals

Thomas Broadbent and Sons, Ltd., of Central Ironworks, Hull, exhibited a 48 in. suspended, direct electrically-driven centrifugal for precipitating fine solids in suspension in a liquid; a 30 in. "Swan-Neck" type centrifugal fitted with monel metal basket for sulphate of ammonia, anthracene, naphthalene, etc.; a 30 in. "Weston" centrifugal, fitted with monel metal basket; a 9 in. experimental centrifugal, for laboratory use; a 15 in. analytical centrifugal, fitted with receivers for test tubes, for laboratory use; a "De Laval" size 500 electrically-driven purifier and clarifier, with variable speed drive; and a "De Laval" size 100 electrically-driven oil purifier.

Disintegrators, Separators and Mills

At the stand of J. Harrison Carter, Ltd., of Engineering Works, Dunstable, were shown a size AA four-screen disintegrator mounted on a stand, fitted own valve discharge, which minimises the possibility of explosions; a self-cleaning electro-magnetic separator and feeder, fitted with dynamo for separating iron from materials when in granular or powder form; a No. 4 mixer and kneader, with stainless steel container and manganese bronze arms, for mixing moist or sticky materials; a No. 1 electro-magnetic separator complete with dynamo and safety valve, which stops the feed should the current fail; a No. 0 vertical runner mill in porcelain, for grinding small quantities or samples for laboratory purposes; an improved granite edge runner mill for grinding and milling crystals, powders, pastes, drugs, etc.; an iron edge runner mill for grinding paint and pigments; and a Carter's "Ideal" disintegrator, for grinding materials used in the chemical and colour trades when only small outputs are required.

Pumps, Mixers, etc.

Joseph Foster and Sons, Ltd., of Soho Foundry, Preston, showed mixers for printing inks, paints, enamels, etc.; a Foster boltless self-locking door for pressure vessels of all kinds; Ogden patent pumps; Sharpe's automatic steam control; patent self-cleaning furnaces.

Roller Mills and Screens

The exhibit of International Combustion, Ltd. (Grinding and Pulverising Offices), 11, Southampton Row, London, included a working model type Raymond roller mill, equipped with double cone air separator, exhaustor, cyclone, piping, and dustbag collector; and a working model Hummer electrically vibrated screen.

Chemical Plant

Chemical plant of various kinds was shown by L. A. Mitchell, of 20, Cooper Street, Manchester, including drying plant for colours, dyes, chemicals and foodstuffs; acid-proof stoneware plant, pipings and fittings, valves and acid pumps for acid and corrosive liquors; and rotary air compressors and vacuum pumps.

Rubber Lining and Rubber Concrete

The exhibit of Nordac, Ltd., of Reno Works, Wealdstone, Harrow, included a method of lining tanks and vessels *in situ* with self-curing sheet rubber. Another exhibit was a slab 5 ft. 6 in. long by 12 in. wide by 1½ in. thick of reinforced rubber concrete. Samples of Nordac rubber-lined steel pipes with flanged and Victaulic joints for the conveyance of hot hydrochloric acid and its solutions were shown, as well as the Nordac patent glandless acid valve for use in connection with the rubber-lined pipes.

Roller Mills and Mixers

Sidney Smith and Blyth, Ltd., of 35, Garratt Lane, Wands-worth, showed single roller mills (various sizes); a four-roll mill of a new type; three-roll mills; a combined plant comprising twin horizontal pug mixer and tandem two-roller mill; whirlpool mixers; pug mixers; and varnish and oil clarifiers.

Tanks and Drums

Tanks and Drums, Ltd., Bowling Iron Works, Bradford, showed oil drums, paint drums and kegs, grease and tar kegs and drums, chemical drums, large light road emulsion drums, dye and colour drums; in various kinds, hooped and unhooped, corrugated and uncorrugated, and plain and decorated.

Society of Chemical Industry

Papers at General Meeting of Midland Section

THE annual meeting of the Birmingham and Midland Section of the Society of Chemical Industry was held at the Engineers' Club, Birmingham, on Thursday, March 14, Mr. W. A. S. Calder presiding. The election of officers for the ensuing session resulted as follows: Chairman, Mr. W. A. S. Calder; vice-chairmen, Dr. H. W. Brownson, Dr. E. D. Mason, and Mr. A. W. Knapp; hon. treasurer, Mr. W. T. Collies; hon. auditor, Dr. C. A. Fox; hon. secretary, Mr. G. King. The following were elected to fill vacancies on the committee: Messrs. H. W. Hewis, A. A. King, C. W. Mobberley, D. W. Parkes, and A. G. R. Whitehouse.

Complaints in the Industry

The chairman delivered a short paper on the analysis of complaints. Complaints were, he said, one of the most serious problems that affected the chemical industry. Properly treated, they could be regarded as a thinly-disguised blessing, but improperly treated, they were a source of serious friction.

As industrial chemists they recognised the fact that the chemicals supplied were, as a general rule, of greater uniformity in quality than most other classes of material. It was most desirable that efforts should be made to get the consumer out of his difficulties, and the best method was to ascertain the source of the trouble, even if that involved visits to the factory from which the complaints were made. Personally, he had investigated some very unusual complaints and he could quote instances where trouble had arisen owing to the materials supplied being too pure.

The Marking of Laboratory Vessels

An interesting paper was read by Mr. A. W. Knapp (chief chemist at Bournville Works), on the marking of laboratory vessels. It had become, he said, a common practice on the part of manufacturers to leave a roughened patch on resistance glass vessels which would take a pencil mark very well, but where this roughened patch was not provided, marks could be scratched on beakers, or flasks, with diamonds. The marks, however, were not easily seen, and, on heating, there was a danger of cracking. Waterproof Indian ink had been used, but this tended to crack off the glass. Grease pencils were very useful for marking beakers, etc., but the mark somewhat easily rubbed off. To mark beakers in which butter or fat had been melted, he had found nothing so good as a coloured spirit solution of shellac, used as ink.

Where one had to regraduate pipettes or flasks, it was often difficult to retain a clear and distinct mark. A good method was to fill the mark with a little ordinary ink and then cover with a small amount of Canada balsam. When allowed to dry and harden, this would remain on the glass for years. For marking tins, the shellac ink described above would be found very useful. An aluminium pencil was useful for marking porcelain vessels. Cobalt nitrate was effective and much cheaper.

Metallic Carbonyls

Mr. W. E. Wallis read some notes on "Metallic Carbonyls." Since the discovery of nickel carbonyl, he said, continuous efforts had been made to obtain similar compounds of other metals. At 50 to 100 atmospheres pressure, at about 250° C., cobalt united with carbon monoxide to form $\text{Co}_2(\text{CO})_8$. Of the numerous other metals subjected to similar treatment only molybdenum, ruthenium, and, perhaps, manganese yielded carbonyls. By organic reactions French chemists had obtained chromium and tungsten carbonyls.

Imperial Chemical Industries, Ltd.

Increase in Profit of Nearly a Million

THE directors of Imperial Chemical Industries, Ltd., announce that the profit for the year 1928 amounts to £5,488,243, representing an increase on 1927 of £921,018. With the £82,680 brought forward from 1927, the total profit available is £5,570,923. Out of this sum the directors have decided to transfer £1,000,000 to General Reserves, £275,540 to Income Tax account and to carry forward to 1929 £109,633, leaving £4,185,750 available for distribution to the shareholders. After providing £1,194,550 for the dividend on the preference shares, there remains £2,991,200 for the ordinary and deferred shareholders. An interim dividend of three per cent. on the ordinary shares was paid on December 1, 1928. The directors have, therefore, decided to recommend a final dividend on the ordinary shares of five per cent. (actual), making eight per cent. for the year, and a dividend on the deferred shares of one and three-quarters per cent. (actual), both less Income Tax at the standard rate for the year 1929/1930, payable on June 1, 1929, to the shareholders on the register of members at April 18, 1929. The registers of ordinary and deferred shareholders will be closed from April 18, 1929, to May 2, 1929, both dates inclusive.

In accordance with the terms of the circular to the shareholders dated June 14, 1928, the new issue of ordinary and deferred shares will rank for this dividend from July 1, 1928, calculated on the amount per share by way of capital credited as paid up and from the due dates of the instalments. The final dividend on the new ordinary capital at the rate of five per cent. and the dividend on the new deferred capital at the rate of one and three-quarters per cent. for the part of the year will therefore be satisfied by the payment of dividends of 4.478688d. gross per ordinary share of £1 and 0.862090 of a penny gross per deferred share of 10s.

During 1927 and 1928 a considerable appreciation took place in the value of investments held by the company's subsidiaries, part of which has been transferred to the company through distributions of assets on liquidations. After making certain appropriations out of the realised surplus so arising, including writing off the whole of the preliminary expenses of £1,260,953, the reserves of the company at December 31, 1928, including the transfers made thereto last year and share premiums, will exceed £11,000,000, as compared with £700,000 at December 31, 1927.

The annual general meeting of the company will be held on April 18, 1929.

Labour Statistics for the Chemical Industry

UNEMPLOYED insured persons at February 25 in Great Britain in the chemical manufacturing industry numbered 6,803 (males 6,025, females 778); in explosives manufacture, 919 (males 654, females 265); in paint, varnish, japan, red and white lead manufacture, 990 (males 829, females 161); and in oil, grease, glue, soap, ink, match, etc., manufacture, 4,681 (males 3,872, females 989). The percentages unemployed in the same industries were 6.8, 4.6, 5.3, and 6.4 respectively. Diseases of occupations reported in February included 1 case of carbon bisulphide poisoning, 3 of aniline poisoning, and 7 of chrome ulceration (3 in the manufacture of bichromates, 2 in dyeing and finishing, and 2 in other industries). Fatal industrial accidents reported during February included 3 in chemical, etc., factories.

Society of Public Analysts

THE next meeting of the Society of Public Analysts will be held on Wednesday, April 3, at the Chemical Society's Rooms, Burlington House, London, at 8 p.m. The following papers will be read:—"Furfural and Diastase in Heated Honey," by Dr. L. H. Lampitt, E. B. Hughes, and H. S. Rooke; "Further Notes on Methods of Sewage and Water Analysis; Anti-Oxidation, and Stabilisation of Pollution," by J. W. Haigh Johnson; "Potassium Cyanate as a Reagent for the Detection of Cobalt," by B. J. F. Dorrington and Dr. A. M. Ward. The registered office of the Society, and the editorial office of *The Analyst*, is now at 85, Eccleston Square, London, S.W.1. The telephone number remains unchanged: Victoria 8363.

The Coming General Election

Important Pronouncement by Sir Ernest Benn

LORD HUGH CECIL, M.P., presided at the 23rd Individualist Bookshop luncheon at the Hotel Cecil on Tuesday. He said that he was an individualist because, according to the order of the universe, the individual was the unit of all moral and intellectual decision. He wanted to keep the State within the limits that were necessary within the social life of the community.

Sir Ernest Benn was the chief speaker. He said that individualists as such were outside party politics, and were not likely to be enthusiastic members of any political party. They might claim to form a considerable part of that pendulum that was needed to keep any party from swinging to extremes. They could be very proud of the fact that during the three or four years of their existence they had exercised considerable influence on the political thought of this country and throughout the world. The greatest question that faced the country at present was a question they could properly discuss, but which it was difficult for any political party to discuss, and that was the safety of democracy itself. He was a convinced democrat. He was alarmed to notice that not only in Italy, but in other countries in Europe and the rest of the world, there was a definite challenge to the principle of democracy and all that it meant. Another question which they could discuss, but which by its nature no party could discuss, was the maintenance of the two-party system. Thirty million voters were, he thought, capable of thinking intelligently in terms of two dimensions, but were not yet sufficiently advanced in political education to think in three dimensions. British government and British public life were the most successful of their kind, and they were based upon the two-party idea.

The confidence and stability on which commerce and industry depended was only possible in a political situation governed by the two-party system. Confidence and stability were the only real cures for unemployment. The work of the business man was to form his own judgment of the political prospects of the moment, and to proceed to act upon it; but it was quite impossible for any business man to operate on the quicksands of a multi-political party system. With two parties, business men the world over were in a position to form some sort of judgment as to what was likely to happen and could proceed to business.

The toast of "The Individualist Bookshop" was proposed by Mr. Archibald Crawford, K.C., and acknowledged by Sir Charles Marston. Lord Lamington proposed the health of Lord Hugh Cecil.

Major Segrave's Triumph

THOUGH delight in Major Segrave's triumph (a correspondent writes) in setting up a new motor speed record at Daytona was quickly marred by the tragedy that befell his American rival, Mr. Lee Bible, yet our pride in the "Golden Arrow" as a distinctly and entirely British achievement remains undimmed. Major Segrave and the designer of the "Golden Arrow," Captain John S. Irving, the former a director and consultant and the latter chief engineer of the Humphrey-Sandberg (Sales) Co., Ltd., have demonstrated the supreme excellence of British car construction. It was by special permission of the Humphrey-Sandberg Co. that Captain Irving was allowed to devote all the necessary time to the design and construction of the "Golden Arrow." This was at the request of Major Segrave, who stated that Captain Irving, in his opinion, was the only man in the world for the job.

Progress of the De Vecchis Process

IN December last it was announced that George Scott and Son (London), Ltd., had received an order from a company in France for one of their large dryers for the drying of sugar beet to work in conjunction with the De Vecchis process. The same firm have now received instructions for another dryer for Sanguinetto, Italy. This will make the third dryer they have installed in that factory. The fact that the company at Sanguinetto are again extending their plant after three years' experience indicates the soundness of the process and satisfaction with the plant for working it.

From Week to Week

NEW LABORATORIES and offices were opened by the Gas Light and Coke Co. at their Kensal Green works recently.

SIR ERNEST RUTHERFORD, president of the Royal Society, will deliver an address on "Atomic Nuclei and Their Transformation" at the general meeting of the German Chemical Society, on May 6, at the Hofmann House, Berlin.

UNIVERSITY NEWS.—*Edinburgh*: The degree of LL.D. has been conferred on Dr. A. P. Laurie, formerly principal of the Heriot-Watt College; and upon Sir James Walker, F.R.S., emeritus professor of chemistry in the University.

DR. IRVING LANGMUIR, president of the American Chemical Society, has had conferred on him the degree of Doktor-Ingenieur of the Berlin Technical High School, "in recognition of his great services as a physical chemist alike to science and technology."

LORD MELCHETT, who is the president of the English Zionist Federation, has given £5,000 to the Keren Heyesod Palestine Foundation Fund. This fund, which was established in 1920, has collected over £3,500,000 from Jews all over the world for constructive work in Palestine.

THE CHILEAN FINANCE MINISTER and the Superintendente Salitre are about to leave for Europe to investigate the results of the Nitrate Centralisation Scheme during this season, and to confer with the leading authorities with a view to inaugurating improvements in the scheme for the coming season.

THE DEPARTMENT OF OVERSEAS TRADE announce that the British Industries Fair will be held next year at Olympia, instead of at the White City, as in the past few years. The Fair will, as usual, open on the third Monday in February, namely, February 17, and will remain open until Friday, February 28.

A FATAL ACCIDENT occurred at the Chemical and Metallurgical Corporation's works at Astmoor, Runcorn, on Wednesday, March 13, to a young German, Theodore Blank, aged 21, employed as an erector. Blank, who had been working throughout the night, was last seen alive at eight o'clock on the same morning, when he gave instructions for the fires to be drawn. His dead body was not discovered until 12.30 p.m., it being presumed that when he went to open the flues he was overcome by carbon monoxide fumes.

THE HON. HENRY MOND, only son of Lord Melchett, was elected Conservative Member of Parliament for the East Toxteth division of Liverpool at the by-election which took place on Tuesday. Mr. Mond, who is 30 years of age, is a director of Barclays Bank; of Imperial Chemical Industries; of the Finance Co. of Great Britain and America; of the Mond Nickel Co.; and of Amalgamated Anthracite Collieries; deputy chairman of the South Staffordshire Mond Gas Co.; and chairman of the Mond Staffordshire Refining Co.

MR. W. H. SUTTON, of Poundstock, Holsworthy, a student of the Seale-Hayne Agricultural College, Newton Abbot, has been appointed chemist and bacteriologist to the United Dairies, Ltd. Mr. Sutton spent three years at the Seale-Hayne College; he was first awarded a Ministry of Agriculture junior scholarship, and later a senior scholarship, and subsequently obtained the college diploma, the national diploma in agriculture, and the national diploma in dairying, as well as the agricultural prize offered to senior students of the college.

RECENT WILLS INCLUDE: Mr. Tom Dawson, a director of the Bradford Dyers' Association (net personalty £20,977), £21,728.—Mr. William Haywood Dawson, F.I.C., analytical chemist, of Bowdon (Cheshire) and Woolwich (net personalty £6,447), £8,439.—Dr. William John Bowis, director of Boots Pure Drug Co., Ltd. (net personalty £13,748), £19,559.—Mrs. Kate Boyd, widow of James Boyd, chemical manufacturer, £595,476. Mr. F. Tunbridge, of Reading, managing director of Dr. Mackenzie's Laboratories, Ltd. (net personalty £12,509), £16,284.

DR. H. MACLEAN WILSON, who has been chief inspector to the West Riding Rivers Board for 32 years, retires on April 1 on superannuation. At a meeting of the Board on Thursday, March 14, the Finance and Parliamentary Committee recommended that the vacancy be advertised, the commencing salary to be £800 per annum, rising by increments of £50, subject to satisfactory service, to a maximum of £1,000, and that Mr. J. H. Garner, F.I.C., assistant chief inspector and chief chemist, should be appointed acting chief inspector *pro tem*. The Board placed on record their appreciation of the valuable services rendered by Dr. Wilson.

THE MIDLAND ROLLING CO., LTD., of Charles Edward Road, South Yardley, were fined 20s. at Birmingham, on Tuesday, March 12, for keeping on their premises 50 lb. of carbide of calcium contrary to the Petroleum Acts, 1871, not having a licence for keeping the same. Inspector Hemming (Explosives and Petroleum Department) said the offence was undoubtedly committed in ignorance of the regulations, which were that carbide of calcium could only be kept without a licence when in separate hermetically sealed metal vessels of 1 lb. Up to 28 lb. of carbide could be kept in sealed vessels if notice were given to the local authority.

AN EXHIBITION of British Empire products is to be held in Buenos Ayres at the end of 1930.

DR. S. G. BARKER, Professor James Kendall, and Professor D. N. M'Arthur have been elected Fellows of the Royal Society of Edinburgh.

LEVER BROTHERS have, it is reported, purchased a tract of land at Sao Paulo and propose to construct there a soap factory, with a capacity of 500 tons daily, to supply the east coast of South America.

THE VOCALION GRAMOPHONE CO. has secured a substantial holding in Brownlac, Ltd., which has been formed to make and market synthetic shellac. The capital of Brownlac is £100,000 in ordinary shares of 5s. each.

DR. L. F. HEWITT, of London Hospital, has been appointed biochemist at the Metropolitan Asylum Board's antitoxin establishment, Belmont Laboratories, Sutton, Surrey. He was formerly a research chemist to the Medical Research Council at Mount Vernon, Hampstead.

IN ADDITION to the cheque for £1,000 contributed to the British Institute in Paris by Mr. Robert Mond a few days ago, Lord Crewe, the chairman of the London Committee, has now received £1,000 from Mrs. Robert Mond. The Institute has received a total of over £71,000.

AT STOCKTON Bankruptcy Court, on March 14, the adjourned examination took place of William Lough Dees, chemical merchant and manufacturer, of Darlington, and it was further adjourned until April 11, the Official Receiver stating that application was being made for the annulment of the bankruptcy.

APPLICATIONS for a Ramsay Memorial Fellowship for chemical research will be considered at the end of June by the Trustees. Particulars may be obtained from the Secretary of the Ramsay Memorial Fellowships Trust, University College, Gower Street, London, W.C.1.

THE ENGLISH STEEL CORPORATION has been formed with a nominal capital of £8,000,000 in 2,000,000 preference and 6,000,000 ordinary shares of £1 each, to acquire from Vickers, Vickers-Armstrong, and Cammell Laird and Co., certain parts of their respective businesses and assets, especially their steel businesses.

MACLAURIN COAL PRODUCTS, LTD., this week invited subscriptions for 30,000 7½ per cent. cumulative participating preference shares of £1, and 10,000 ordinary shares of £1, the subscription list being closed on or before Monday, March 25. The object of the company is to promote the Maclaurin processes in connection with the low temperature carbonisation of coal.

MRS. RUDOLPH MUSPRATT gave birth to twin sons on Friday, March 15, at the Grange, Fulwood Park, Liverpool, the residence of her father-in-law, Sir Max Muspratt. The mother and her two sons are progressing satisfactorily. Mr. Rudolph Muspratt, who was the only son of Sir Max and Lady Muspratt, died on January 28, following a second operation after appendicitis.

Obituary

PROFESSOR FREDERIC KEHRMAN, in Lausanne, on March 4, aged 64.

PROFESSOR WILLIAM KUSTER, of the department of inorganic and pharmaceutical chemistry of the Stuttgart Technical High School, on March 5, aged 66.

MR. WILLIAM HYNES, a former member of the Manchester City Council, and for 21 years associated with the Manchester branch of the United Turkey Red Co., aged 75.

MR. HARRY HILL GARDAM, managing director of Harry H. Gardam and Co., Ltd., of Staines, engineers, machinery and chemical plant merchants, on Wednesday, March 20, aged 47.

MR. JOSEPH COLLETT SMITH, secretary of the Wellcome Foundation, Ltd., and manager of the estates department of Burroughs, Wellcome and Co., aged 64. Mr. Smith was well-known as a Mason.

DR. T. B. OSBORNE, in America, on January 29, aged 69. He had been research chemist at the Connecticut Experiment Station since 1886, and was well-known for his work on the vegetable proteins and related subjects.

MR. CHARLES STANLEY, aged 48, general manager of the Birmingham section of the British Industries Fair at Castle Bromwich, on Monday. Mr. Stanley was found with his head resting on an unlighted gas stove, with the tap open.

DR. PAUL DVORKOVITZ, on March 16, in Paris, aged 72. He was an authority on petroleum, and developed the method of low temperature carbonisation known as the Dvorkovitz process. An extended obituary appears on p. 292.

MAJOR A. MOWBRAY JONES, representative and metallurgical engineer for Minerals Separation, Ltd., in South Africa, aged 60. A native of Cheltenham and holding a commission in the Gloucester Regiment, Major Mowbray Jones served through the war and was awarded the M.C. On leaving the army to take up metallurgical engineering, he became connected with the Ehrlich group in South Africa, and later joined the metallurgical staff of Minerals Separation, Ltd., and served at the London headquarters. He was a member of the council of the Chemical, Metallurgical and Mining Society of South Africa.

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The vapour pressures of some salt solutions of importance for the ammonia-soda process. B. Neumann, R. Domke, and E. Altman. *Zeitschrift angewandte Chem.*, March 16, pp. 279-283. The vapour pressures measured were as follows: ammonium hydrogen carbonate; ammonium hydrogen carbonate-sodium hydrogen carbonate; ammonium hydrogen carbonate-ammonium chloride; ammonium hydrogen carbonate-sodium hydrogen carbonate-ammonium chloride.
HYDROGENATION.—The kinetics of the hydrogenation of ethylene at a copper catalyst of measured surface. F. H. Constable. *Zeitschrift Elektrochemie*, March, pp. 105-110.
ORGANIC.—The splitting of halogen from halogenated elao-stearic acid with remarks on the detection of phthalic acid by the fluorescein reaction. D. Holde, W. Bleyberg, and M. A. Aziz. *Zeitschrift angewandte Chem.*, March 16, pp. 283-284.

Miscellaneous

- ANALYSIS.—Analysis of acetic anhydride in the presence of strong acids by thermometric titration. T. Somiya. *Proceedings Imperial Academy, Japan*, January, pp. 34-37 (in English).
COAL DISTILLATION.—Dry distillation of some Japanese coals. C. Iwasaki and K. Sasaki. *Proceedings Imperial Academy, Japan*, December, 1928, pp. 593-596 (in English).
GENERAL.—A new method for the preparation of phosphorescent zinc sulphide. R. Coustal and F. Prevot. *Comptes Rendus*, March 4, pp. 703-705 (in French).
ORGANIC.—On the polymerisation of highly unsaturated acids. Y. Toyama and T. Tsuchiya. *J. Soc. Chem. Ind. Japan* (supplemental binding), February, pp. 44-45B (in English).
On the polymerisation of methyl esters of highly unsaturated acids. Y. Toyama and T. Tsuchiya. *J. Soc. Chem. Ind. Japan* (supplemental binding), February, pp. 45-47B (in English).
PERYLENE.—Investigations on perylene and its derivatives. XIX.—A. Zinke, W. Hirsch, and E. Brozek. *Monatshäfte für Chem.*, Vol. 51, Parts 2-3, pp. 205-220.—XX.—K. Fimke, F. Kirchmayr, and H. Wolf. *Ibid.*, pp. 221-227.—XXI.—A. Pongratz and E. Pöschmüller. *Ibid.*, pp. 228-233 (in German).

Patent Literature

The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

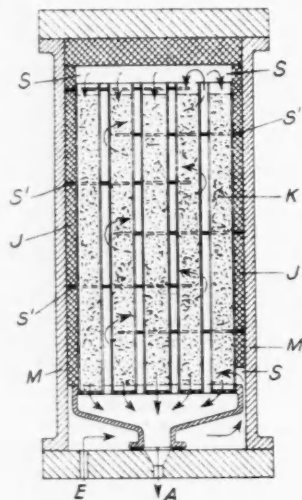
Abstracts of Complete Specifications

306,051. ALKYLISO-ALKYLENE-PHENOLS AND ALKYLATED CUMARANES, MANUFACTURE OF. Chemische Fabrik auf Actien (vorm. E. Schering), 170, 171, Mullerstrasse, Berlin, and H. Jordan, 1, Kellerstrasse, Steglitz, Berlin. Application date, August 15, 1927. Addition to 273,686.

Specifications Nos. 273,684 and 273,686 (see THE CHEMICAL AGE, Vol. XVII, pp. 221 and 222) describe the preparation of condensation products from *m*- and *p*-cresol and aliphatic ketones, and their thermal decomposition for the production of alkyl-isopropylene-phenols and alkylated-cumaranes. In this invention, the thermal decomposition is conducted in the presence of a metal catalyst such as nickel or metal phenolates or porous materials with or without a metal compound. The catalyst may be added to the material before heating, and the decomposition then effected in vacuo. About 0.1 per cent. of aluminium or magnesium phenolate may be used. Alternatively, the vapour may be passed over the catalyst which may be fuller's earth, diatomite, or silica gel, on which nickel or nickel oxide is precipitated. The material to be treated may be added continuously to a still, and the vapour may be passed to a dephlegmator.

306,054. CARRYING OUT EXOTHERMIC GAS REACTIONS, APPARATUS FOR. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. Application date, September 15, 1927.

In apparatus for exothermic gas reactions at high temperature and pressure the walls of the reaction vessel are cooled



306,054

by the incoming gases. The reaction vessel may be surrounded by a jacket having a spiral partition or baffle, and the incoming gas flows through the spiral passage to cool the reaction chamber. In another apparatus for the synthesis of ammonia, the catalyst tubes K are spaced apart in a casing M lined with heat insulating material J. The nitrogen-hydrogen mixture enters at E and passes around the catalyst tubes in a sinuous course which is produced by baffles S'. The gas then passes into the space S, and then downwards through the catalyst to the outlet A.

306,052. SULPHONIC ACIDS, PRODUCTION OF. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. Application date, September 14, 1927.

Sulphonic acids are obtained from unsaturated hydrocarbons of the aliphatic or hydroaromatic series or substitution

products by treating them with sulphonating agents in the presence of such compounds as are known to form oxonium, ammonium or sulphonium compounds or with esters of chlor sulphonic acid. Compounds which form the above additive products include diethylsulphide, diethyl ether, acetic ethyl ester, acetic methyl ester, diethylene oxide, pyridine, etc. The sulphonation process is only applicable to unsaturated aliphatic acids containing one or more hydroxyl groups if an excess of the sulphonating agent is employed, otherwise sulphuric acid esters are formed. Examples are given of the sulphonation of oleic acid, tetrahydrobenzene, etc.

306,305. PURE HYDRATED CHROMIC CHLORIDE, MANUFACTURE OF. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. Application date, March 23, 1928. Addition to 271,016.

Specification No. 271,016 (see THE CHEMICAL AGE, Vol. XVI, p. 604) describes the production of pure water-soluble hydrated chromic chloride from commercial anhydrous chromic chloride in the presence of a cathodically polarized conductor. In this invention, the solution is effected in the presence of a reducing catalytic substance such as iron, chromium, zinc, tin, aluminium, or reducing salts of these. Preferably chromous chloride is employed, since this is converted into chromic chloride which does not contaminate the solution. The amount of water employed corresponds approximately to the formula $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$. Air is excluded during the process, and an example is given.

306,352. MONOCYCLIC LACTONES WITH 14 TO 18 RING MEMBERS, PROCESS FOR THE PREPARATION OF. Soc. Anon. M. Naef and Cie., 1, Rue des Mélézes, Plainpalais-Geneva, Switzerland. Application date, June 26, 1928. Addition to 294,602.

Specification No. 235,540 (see THE CHEMICAL AGE, Vol. XIII, p. 176) describes ketones having 13 to 17 ring members, and these are heated with permonosulphuric acid to 30° – 60° C. In this manner, it is possible to obtain from cyclo-tridecanone the lactone of 12 oxy-dodecane-1-carboxylic acid, from cyclo-tetradecanone the lactone of 13-oxy-tridecane-1-carboxylic acid, from cyclo-hexadecanone the lactone of 15-oxy-pentadecane-1-carboxylic acid, and from cyclo-heptadecanone (dihydro civetone) the lactone of 16-oxy-hexadecane-1-carboxylic acid. Lactones can be obtained from the alkylated ketones described in specification No. 263,153. (See THE CHEMICAL AGE, Vol. XVI, p. 217.) The products are perfumes.

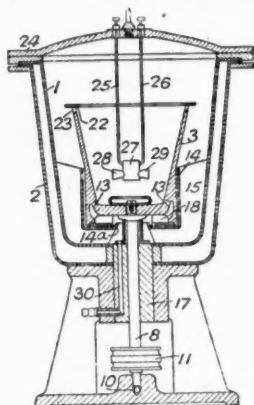
NOTE.—Abstracts of the following specifications, which are now accepted, appeared in THE CHEMICAL AGE when they became open to objection under the International Convention:—280,947 (Silica Gel Corporation) relating to removal of sulphur compounds from gases, see Vol. XVIII, p. 85; 289,885 (F. Fischer) relating to removal of sulphuretted hydrogen from gases, see Vol. XIX, p. 35; 290,647 (International Nickel Co.) relating to nickel and nickel alloys, see Vol. XIX, p. 15 (Metallurgical Section); 291,347 (I.G. Farbenindustrie Akt.-Ges.) relating to diacidyl derivatives of naphthalene and acenaphthene, see Vol. XIX, p. 105.

International Specifications not yet Accepted

303,900. CHEMICAL PROCESSES AND APPARATUS. M. Polanyi, 15, Waltrandstrasse, Zehlendorf, Berlin, and S. von Bogdandy, 14, Konigin-Luisenstrasse, Dahlem, Berlin. International Convention date, January 12, 1928.

Substances which cannot be heated are dissolved in an inert solvent and passed at high velocity and with continual renewal of the outer surface, past the vapour of substances which are only reactive in that condition, in order to cause combination. This process may be applied to the reaction of copper, silver, carbon, or metallic oxides, with organic substances. A vessel 1 having a cooling jacket 2 contains a rotating vessel 3 mounted on a driven shaft 8. The vessel 3 is closely surrounded by an envelope 14 carried by fins 15. A centrifugal pump 18

draws in liquid through the inlet 14*a* and discharges it through openings 13 in the vessel 3, so that it passes up the sloping sides of the vessel to the outlet 23. The substance to be



303,900

vaporised is heated electrically in a container 27, and the vapour passes through openings 28, 29 against the rapidly moving film of liquid on the wall of the vessel 3. The products are withdrawn at 30.

304,118. KETONIC ACID ESTERS. Dr. A. Wacker Ges. für Elektrochemische Industrie Ges., 20, Prinzregentenstrasse, Munich, Germany. International Convention date, January 14, 1928.

These esters are obtained by treating a carboxylic acid ester of butyl alcohol or of a higher alcohol with a metal alcoholate. Thus sodium butylate is heated with butyl acetate in a column still, the residue is acidified, the salt separated, and the mixture of esters fractionated in vacuo to obtain aceto-acetic acid butyl esters.

304,135. EARTH METAL HALIDES. F. Krupp Grusonwerk Akt.-Ges., Buckau, Magdeburg, Germany. International Convention date, January 14, 1928.

Halogen or double halogen compounds, *e.g.*, aluminium halides and cryolite, are produced and volatilised from raw materials by mixing with fuel and treating with a halogen-containing substance in a rotary tubular furnace. The heat is supplied by the gradual combustion of the added fuel. Volatilised halides are condensed by cooling and electrical precipitation, or by wet washing of the gases.

304,150. OBTAINING ACIDS, ALCOHOLS, AND HYDROCARBONS FROM WAXES. I.G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. International Convention date, January 14, 1928.

Beeswax, montan wax, and wool fat are saponified and atomised to obtain a dry powder which is extracted with solvents and the soaps acidified. Some examples are given.

304,179. PURIFYING ANTHRACENE. Selden Co., 339, 2nd Avenue, Pittsburg, U.S.A. (Assignees of A. O. Jaeger, 9, North Grandview Avenue, Crafton, Pa., U.S.A.). International Convention date, January 16, 1928.

Crude anthracene is subjected to a selective solvent treatment with a solvent having a furane nucleus, *e.g.*, methyl and dimethyl furanes, esters of furoic acid, or furfural. The solubility of anthracene at 15°–20° C. is low, and that of phenanthrene and carbazole is high. This process may follow a preliminary purification with phenanthrene solvents, *e.g.*, benzene, toluene, solvent naphtha, or orthodichlorobenzene. The furane compound may be recovered from the residual cake by washing with other solvents or by blowing with superheated steam. The residual cake containing phenanthrene, carbazole, and traces of anthracene is treated with 98 per cent. sulphuric acid at 20°–25° C., or by fusion with caustic potash and/or indifferent diluents at 150°–250° C. forming an alkali salt of carbazole. The residual cake may then be subjected to vapour phase catalytic purification in the presence of catalysts favouring the combustion of carbazole, *e.g.*, cobalt copper, or ferric oxide stabilized with potassium hydroxide or nitrate.

304,207. SYNTHETIC RUBBER. I.G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. International Convention date, January 16, 1928.

Synthetic latex is coagulated by cooling below 0° C., and then thawed and the coagulum separated. In an example, isoprene is emulsified with sodium oleate solution and heated to 60° C. for four days. A latex is formed by adding water, and is cooled to –15° C. and the coagulum separated after thawing. Some other examples are given.

304,245. DYES. Soc. of Chemical Industry in Basle, Switzerland. International Convention date, January 17, 1928. Addition to 279,479.

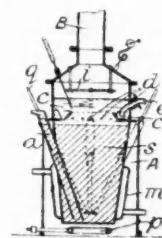
Dibenzanthronyl sulphonic acids are fused with alkali to obtain vat dyes which may be alkylated to obtain other vat dyes similar to those of specification 279,479. Examples are given.

304,280. SYNTHETIC DRUGS. I.G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. International Convention date, January 18, 1928. Addition to 283,510.

Specification 283,510 (see THE CHEMICAL AGE, Vol. XVIII, p. 248) describes nitro-9-aminoacridine derivatives obtained by condensing a nitro-9-chloro or 9-alkoxy-acridine with a base containing at least two nitrogen atoms of which one is a primary one. In this invention, the condensation is effected first with an amino acid or an ester or a nitrile thereof, and the nitro-acridyl-amino acid obtained is converted into a basic amide by means of a primary or secondary amine which also contains at least one tertiary basic nitrogen atom. Several examples are given.

304,282. METALLIC CHLORIDES. G. A. Favre, 33, Rue de Cavenne, Lyon, France. (Assignee of J. Goriany, Geneva, Switzerland.) International Convention date, January 18, 1928.

Tin alloys are treated at 900° C. with chlorine, and volatilized chlorides—*e.g.*, of iron, aluminium and antimony—are separated by fractional condensation before that of tin.



304,282

Lead and copper chlorides are run off from the surface of the melt. Metal is supplied through a tube *a* to a vessel *A* heated initially by a burner *p*, and cooled afterwards by a jacket *m*. Chlorine is supplied through a quartz tube *q*. Molten chlorides collect above a partition *c* and are tapped off at *e*. Volatilized chlorides pass over a baffle *i* to an outlet *B* leading to a condenser.

304,298. DYES. Compagnie Nationale de Matières Colorantes et Manufactures de Produits Chimiques du Nord Réunies Etablissements Kuhlmann, 11, Rue de la Baume, Paris. International Convention date, January 19, 1928.

Azo dyes are obtained by coupling diazotized *o*-aminophenols or *o*-aminonaphthols or substitution products with pyrazolones derived from aminoaryl-sulphamides, preferably of the general formula $\text{NH}_2\text{--R}^1\text{X--NH--SO}_2\text{--R}^2\text{Y}$ in which R^1 and R^2 are benzene nuclei, and *X* and *Y* are hydrogen, methyl, methoxy, phenoxy, chlorine, or $\text{--SO}_3\text{H}$. The dyes have a mordant character and may be converted into chromium compounds. The pyrazolones are obtained by condensation of the amino-aryl-pyrazolone with the appropriate aryl-sulphochloride. Examples are given.

304,808. SULPHURIC ACID. Metallges. Akt.-Ges., Frankfurt-on-Main, Germany. International Convention date, January 19, 1928.

Sulphur dioxide is oxidised more quickly in presence of nitrogen oxides, by rapidly whirling the gas mixture without separating the liquid particles.

LATEST NOTIFICATIONS.

- 307,480. Dyeing. Schueller, E. March 10, 1928.
 307,484. Process for the production of a barbituric acid compound. Hefti, F. March 9, 1928.
 307,457. Catalytic ammonia synthesis. Selden Co. March 8, 1928.
 307,343. Manufacture and production of pure benzoic acid. I.G. Farbenindustrie Akt.-Ges. March 5, 1928.
 307,361. Process for the manufacture of cellulose ether oxyn lacquers. I.G. Farbenindustrie Akt.-Ges. March 5, 1928.
 307,436. Manufacture of lakes or pigments. I.G. Farbenindustrie Akt.-Ges. March 7, 1928.
 307,471. Manufacture of ethyl acetate. I.G. Farbenindustrie Akt.-Ges. March 8, 1928.
 307,481. Process for the manufacture of vat dyestuffs of the anthranthrone series. I.G. Farbenindustrie Akt.-Ges. March 10, 1928.
 307,704. Manufacture of azo-dyestuffs. I.G. Farbenindustrie Akt.-Ges. March 10, 1928.
 307,705. Manufacture of dyestuffs. Soc. of Chemical Industry in Basle. March 10, 1928.
 307,709. Production of sulphonic acids of higher molecular-weight. Deutsche Hydrierwerke Akt.-Ges. March 9, 1928.
- Specifications Accepted with Date of Application**
 279,488. Light hydrocarbons, Process of obtaining. J. M. F. D. Flotentin, A. J. Kling and C. Matignon. October 23, 1926.
 280,529. Tetrazoles, Processes for preparing. A. Boehringer. November 10, 1926.
 281,713. Dyestuffs, Manufacture of. Soc. of Chemical Industry in Basle. December 4, 1926.
 285,071. Halide addition products, polymers, and oxides of rubber, Preparation of. Goodyear Tire and Rubber Co. February 11, 1927.
 286,720. Chlorinating hydrocarbons. International Fireproof Products Corporation. March 11, 1927.
 290,195. Therapeutic product, Method of preparing. C. Jaeger. May 9, 1927.
 295,591. Crude benzols, Apparatus for the preliminary separation of. Soc. des Etablissements Barbet. August 12, 1927.
 296,974 and 301,415. Acetic acid in the anhydrous state from its aqueous solutions, Continuous processes for the manufacture of. Soc. Anon. des Distilleries des Deux Sèvres. September 10, 1927.
 300,114. Indigoid vat dyestuffs, Manufacture of. I.G. Farbenindustrie Akt.-Ges. November 5, 1927. Addition to 282,805.
 288,193. Reducing ore and converting hydrocarbons. W. H. Smith. April 4, 1927.
 306,859. Copper amine complex azo compounds, Process for the manufacture of. A. Carpmael. (I.G. Farbenindustrie Akt.-Ges.). November 21, 1927.
 306,874. Vat dyestuffs, Manufacture of. J. Y. Johnson. (I.G. Farbenindustrie Akt.-Ges.). August 22, 1927.
 306,875. Condensation products of dimethylol urea or dimethylol thiourea, Manufacture and production of. J. Y. Johnson. (I.G. Farbenindustrie Akt.-Ges.). August 27, 1927.
 306,998. Metallic nitrates, Manufacture of. A. Carpmael. (I.G. Farbenindustrie Akt.-Ges.). December 1, 1927.
 307,104. Azo-dyestuffs, Manufacture of. A. Carpmael. (I.G. Farbenindustrie Akt.-Ges.). December 2, 1927.
 307,111. Brown coal, Manufacture of products from—analogue to montan wax. J. Y. Johnson. (I.G. Farbenindustrie Akt.-Ges.). December 3, 1927.
 307,112. Cobalt carbonyl, Production of. J. Y. Johnson. (I.G. Farbenindustrie Akt.-Ges.). December 3, 1927.
 307,130. Ortho-nitrodiaryl ethers and ortho-amino-diaryl ethers, Manufacture of. O. Y. Imray. (I.G. Farbenindustrie Akt.-Ges.). December 15, 1927.
 307,137. Esters, Manufacture of. Imperial Chemical Industries, Ltd., W. Gibson and J. B. Payman. December 21, 1927.
 307,150. Insoluble azo dyestuffs, Manufacture of. O. Y. Imray. (I.G. Farbenindustrie Akt.-Ges.). December 31, 1927.
 307,188 and 307,190. Iron pyrites, Treatment of. S. I. Levy and G. W. Gray. February 10, 1928.
 307,223. Aromatic carboxylic acids, Production of. J. Y. Johnson. (I.G. Farbenindustrie Akt.-Ges.). March 21, 1928.
 307,230. Fertilisers. J. Y. Johnson. (I.G. Farbenindustrie Akt.-Ges.). March 30, 1928.
 307,243. Fractional distillation of tar, crude oils, petroleum and other liquids, Apparatus for. O. Elstermann and A. Baumbör. April 30, 1928.
- Applications for Patents**
 Blumenfeld, J. Production of zirconium, etc., oxides. 7,938-March 11. (Germany, March 15, 1928.)
 Brightman, R. Azo dyes. 8,186. March 13.
 British Celanese, Ltd. Preparation of oxygenated organic compounds. 8,034. March 12. (United States, March 22, 1928.)
 British Celanese, Ltd. Production of artificial materials. 8,035-March 12.
 British Celanese, Ltd., and Olpin, H. C. Manufacture of dyestuffs, etc. 8,036, 8,037. March 12.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of diazo amino compounds. 7,959. March 11.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of water-soluble leuco esters of vat dyestuffs. 7,960. March 11.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Dyeing cellulose derivatives. 8,000. March 12. (December 13, 1927.)
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of condensation products from organic arsenic oxides. 8,210-March 13.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of water-soluble thio-derivatives of phenols. 8,389. March 14.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of alkyl cellulose esters. 8,390. March 14.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of rubber-like masses. 8,391. March 14.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of azo dyestuffs on the fibre. 8,392. March 14.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Motor fuel oils. 8,393. March 14.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of condensation products from aldehydes. 8,394, 8,395. March 14.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of anthraquinone derivatives. 8,527. March 15.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of hydroxy carboxylic acids. 8,591. March 16.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Treating synthetic rubber, etc. 8,592. March 16.
 Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of diaminoazo anthraquinones. 8,593. March 16.
 Deutsche Hydrierwerke Akt.-Ges. Production of sulphonic acids of higher molecular weight. 7,969. March 11. (Germany, March 9, 1928.)
 Distilleries des Deux-Sèvres. Extraction of acetic acid from pyro-ligneous acid. 8,491. March 15. (Belgium, July 28, 1928.)
 Distilleries des Deux-Sèvres. Extraction of acetic acid from pyro-ligneous acid. 8,584. March 16. (Belgium, January 25.)
 Ellis, G. B., and Soc. des Usines Chimiques Rhone-Poulenc. Manufacture of soluble cellulose esters of higher acids. 7,914. March 11.
 Hess, K. Manufacture of ammoniacal copper cellulose solutions. 8,531. March 15. (Germany, March 16, 1928.)
 Hilditch, T. P. Production of fats. 7,817. March 11.
 I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of liquid fuels. 7,892. March 11.
 I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Cultivation of micro-organisms. 7,893. March 11.
 I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Casting moulds. 7,894. March 11.
 I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of carbon black. 7,895. March 11.
 I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of olefines. 7,896. March 11.
 I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Stuffing boxes. 7,897. March 11.
 I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of organic acids. 7,898. March 11.
 I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of carbonates. 7,899. March 11.
 I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of aliphatic amines. 7,900. March 11.
 I.G. Farbenindustrie Akt.-Ges. and Imray, O. Y. Manufacture of preparations for production of dyestuffs. 8,059. March 12.
 I.G. Farbenindustrie Akt.-Ges. and Imray, O. Y. Manufacture of sulphonic acids of 1- α -aminomethylnaphthalene. 8,060-March 12.
 I.G. Farbenindustrie Akt.-Ges. and Imray, O. Y. Manufacture of lacquers. 8,198. March 13.
 I.G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of lacquers, etc. 8,301, 8,302, 8,303, 8,304, 8,305, 8,306, 8,307-March 14. (June 2, 1928.)
 I.G. Farbenindustrie Akt.-Ges. Recovery of organic acids. 8,342, 8,343. March 14.
 I.G. Farbenindustrie Akt.-Ges. Synthesis of ammonia. 8,344-March 14.
 I.G. Farbenindustrie Akt.-Ges. Production of wetting, etc., agents. 8,457. March 15. (October 15, 1927.)
 I.G. Farbenindustrie Akt.-Ges. Recovery of oils from industrial residues. 8,475, 8,476. March 15.
 I.G. Farbenindustrie Akt.-Ges. Production of lacquers. 8,477-March 15.
 I.G. Farbenindustrie Akt.-Ges. Production of soluble polymerization products. 8,478. March 15.
 I.G. Farbenindustrie Akt.-Ges. Production of 5-8-dihalogen-1-2-benzanthraquinones. 8,479. March 15.
 I.G. Farbenindustrie Akt.-Ges. and Mond, A. L. Process for washing gas liquors. 8,485. March 15.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

ACID ACETIC, 40% TECH.—£19 per ton.
 ACID BORIC, COMMERCIAL.—Crystal, £30 per ton; powder, £32 per ton; extra fine powder, £34 per ton.
 ACID HYDROCHLORIC.—3s. 9d. to 6s. per carboy d/d, according to purity, strength and locality.
 ACID NITRIC, 80° Tw.—£21 10s. to £27 per ton, makers' works, according to district and quality.
 ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations; 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.
 AMMONIA ALKALI.—£6 15s. per ton f.o.r. Special terms for contracts.
 BISULPHITE OF LIME.—£7 10s. per ton, f.o.r. London, packages free.
 BLEACHING POWDER.—Spot, £9 10s. per ton d/d; Contract, £8 10s. per ton d/d, 4-ton lots.
 BORAX, COMMERCIAL.—Crystals, £19 10s. to £20 per ton; granulated, £19 per ton; powder, £21 per ton. (Packed in 2 cwt. bags carriage paid any station in Great Britain.)
 CALCIUM CHLORIDE (SOLID).—£5 to £5 5s. per ton d/d carr. paid.
 COPPER SULPHATE.—£25 to £25 10s. per ton.
 METHYLATED SPIRIT 61 O.P.—Industrial, 1s. 3d. to 1s. 8d. per gall. pyridinised industrial, 1s. 5d. to 1s. 10d. per gall.; mineralised 2s. 4d. to 2s. 8d. per gall.; 64 O.P., 1d. extra in all cases.
 NICKEL SULPHATE.—£38 per ton d/d.
 NICKEL AMMONIA SULPHATE.—£38 per ton d/d.
 POTASH CAUSTIC.—£30 to £33 per ton.
 POTASSIUM BICHROMATE.—4½d. per lb.
 POTASSIUM CHLORATE.—3½d. per lb., ex-wharf, London, in cwt. kegs.
 SALAMMONIAC.—£45 to £50 per ton d/d. Chloride of ammonia, £37 to £45 per ton, carr. paid.
 SALT CAKE.—£3 15s. to £4 per ton d/d. In bulk.
 SODA CAUSTIC, SOLID.—Spot lots delivered, £15 2s. 6d. to £18 per ton, according to strength; 20s. less for contracts.
 SODA CRYSTALS.—£5 to £5 5s. per ton, ex railway depots or ports.
 SODIUM ACETATE 97/98%.—£21 per ton.
 SODIUM BICARBONATE.—£10 10s. per ton, carr. paid.
 SODIUM BICHROMATE.—3½d. per lb.
 SODIUM BISULPHITE POWDER, 60/62%.—£17 10s. per ton delivered for home market, 1-cwt. drums included; £15 10s. f.o.r. London.
 SODIUM CHLORATE.—2½d. per lb.
 SODIUM NITRITE, 100% BASIS.—£27 per ton d/d.
 SODIUM PHOSPHATE.—£14 per ton, f.o.b. London, casks free.
 SODIUM SULPHATE (GLAUBER SALTS).—£3 12s. 6d. per ton.
 SODIUM SULPHIDE CONC. SOLID, 60/65.—£13 5s. per ton d/d. Contract, £13. Carr. paid.
 SODIUM SULPHIDE CRYSTALS.—Spot, £8 12s. 6d. per ton d/d. Contract, £8 10s. Carr. paid.
 SODIUM SULPHITE, PEA CRYSTALS.—£14 per ton f.o.b. London, 1-cwt. kegs included.

Coal Tar Products

ACID CARBOLIC CRYSTALS.—6½d. to 6¾d. per lb. Crude 60's, Mar., 1s. 10½d. per gall. April/June, 1s. 10d. per gall.
 ACID CRESYLIC 99/100.—2s. 3d. to 2s. 10d. per gall. 97/99.—2s. 1d. to 2s. 2d. per gall. Pale, 95%, 1s. 10d. to 1s. 11d. per gall. Dark, 1s. 7½d. to 1s. 8½d.
 ANTHRACENE.—A quality, 2d. to 2½d. per unit. 40%, £4 10s. per ton.
 ANTHRACENE OIL, STRAINED.—5½d. to 6d. per gall. for 1080/1090. Unstrained, 6½d. to 7d. per gall.
 BENZOLE.—Prices at works: Crude, 10d. to 11d. per gall.; Standard Motor, 1s. 5d. to 1s. 6d. per gall.; 90%, 1s. 7d. to 1s. 8d. per gall.; Pure, 1s. 10d. to 1s. 11d. per gall.
 TOLUOLE.—90%, 1s. 7½d. to 2s. per gall. Firm. Pure, 2s. to 2s. 2d. per gall.
 XYLOL.—1s. 5d. to 2s. per gall. Pure, 1s. 8d. to 1s. 9d. per gall.
 CREOSOTE.—Cresylic, 20/24%, 7½d. to 7¾d. per gall.; Heavy, 6½d. to 6¾d. per gall. Middle oil, 5d. to 5½d. per gall. Standard specification, 3½d. to 4½d. per gall. ex works. Salty, 7½d. per gall.
 NAPHTHA.—Crude, 8½d. to 9d. per gall. Solvent, 90/160, 1s. 3½d. to 1s. 4d. per gall. Solvent, 95/160, 1s. 4d. to 1s. 8d. per gall. Solvent 90/190, 1s. 1d. to 1s. 4d. per gall.
 NAPHTHALENE, CRUDE.—Drained Creosote Salts, £4 10s. to £5 per ton. Whizzed, £5 per ton. Hot pressed, £8 10s. per ton.
 NAPHTHALENE.—Crystals, £12 5s. to £14 10s. per ton. Quiet Flaked, £14 to £15 per ton, according to districts.
 PITCH.—Medium soft, 32s. to 35s. per ton, f.o.b., according to district. Nominal.
 PYRIDINE.—90/140, 4s. to 4s. 6d. per gall. 90/180, 2s. to 3s. per gall. Heavy, 1s. 6d. to 1s. 9d. per gall.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:
 ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.
 ACID ANTHRANILIC.—6s. per lb. 100%.
 ACID BENZOIC.—1s. 8½d. per lb.
 ACID GAMMA.—4s. 6d. per lb.
 ACID H.—3s. per lb.
 ACID NAPHTHIONIC.—1s. 6d. per lb.
 ACID NEVILLE AND WINTHER.—4s. 9d. per lb.
 ACID SULPHANILIC.—8½d. per lb.
 ANILINE OIL.—8d. per lb. naked at works.
 ANILINE SALTS.—8d. per lb. naked at works.
 BENZALDEHYDE.—2s. 3d. per lb.
 BENZIDINE BASE.—3s. 3d. per lb. 100% basis d/d.
 BENZOIC ACID.—1s. 8½d. per lb.
 o-CRESOL 29/31° C.—5½d. per lb.
 m-CRESOL 98/100%.—2s. 3d. to 2s. 6d. per lb.
 p-CRESOL 32/34° C.—2s. 3d. to 2s. 6d. per lb.
 DICHLORANILINE.—1s. 10d. per lb.
 DIMETHYLANILINE.—1s. 11d. per lb.
 DINITROBENZENE.—8d. per lb. naked at works. £75 per ton.
 DINITROCHLOROBENZENE.—£84 per ton d/d.
 DINITROTOLUENE.—48/50° C. 7½d. per lb. naked at works. 66/68° C. 9d. per lb. naked at works.
 DIPHENYLAMINE.—2s. 10d. per lb. d/d.
 a-NAPHTHOL.—2s. per lb. d/d.
 B-NAPHTHOL.—10d. per lb. d/d.
 a-NAPHTHYLAMINE.—1s. 3d. per lb.
 B-NAPHTHYLAMINE.—3s. per lb.
 o-NITRANILINE.—5s. 9d. per lb.
 m-NITRANILINE.—3s. per lb. d/d.
 p-NITRANILINE.—1s. 8d. per lb.
 NITROBENZENE.—6d. per lb. naked at works.
 NITRONAPHTHALENE.—1s. 3d. per lb.
 R. SALT.—2s. 2d. per lb.
 SODIUM NAPHTHIONATE.—1s. 8½d. per lb. 100% basis d/d.
 o-TOLUIDINE.—8d. per lb.
 p-TOLUIDINE.—1s. 9d. per lb. naked at works.
 m-XYLIDINE ACETATE.—2s. 6d. per lb. 100%.
 N. W. ACID.—4s. 9d. per lb. 100%.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 15s. to £10 5s. per ton. Grey, £16 10s. to £17 10s. per ton. Liquor, 9d. per gall.
 ACETONE.—£78 per ton.
 CHARCOAL.—£6 to £8 10s. per ton, according to grade and locality.
 IRON LIQUOR.—1s. 3d. per gall. 32° Tw. 1s. per gall. 24° Tw.
 RED LIQUOR.—9d. to 10½d. per gall. 16° Tw.
 WOOD CRESOTE.—1s. 9d. per gall. Unrefined.
 WOOD NAPHTHA, MISCIBLE.—3s. 8d. to 3s. 11d. per gall. Solvent, 4s. to 4s. 3d. per gall.
 WOOD TAR.—£3 10s. to £4 10s. per ton.
 BROWN SUGAR OF LEAD.—£38 per ton.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 3d. per lb. according to quality; Crimson, 1s. 4d. to 1s. 6d. per lb., according to quality.
 ARSENIC SULPHIDE, YELLOW.—1s. 9d. per lb.
 BARYTES.—£5 10s. to £7 per ton, according to quality.
 CADMIUM SULPHIDE.—5s. to 6s. per lb.
 CARBON BISULPHIDE.—£25 to £27 10s. per ton, according to quantity
 CARBON BLACK.—5½d. per lb., ex wharf.
 CARBON TETRACHLORIDE.—£45 to £54 per ton, according to quantity, drums extra.
 CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.
 DIPHENYLGUANIDINE.—3s. 9d. per lb.
 INDIARUBBER SUBSTITUTES, WHITE AND DARK.—4½d. to 5½d. per lb.
 LAMP BLACK.—£32 10s. per ton, barrels free.
 LEAD HYPOSULPHITE.—9d. per lb.
 LITHOPONE, 30%.—£23 per ton.
 MINERAL RUBBER "RUBPRON".—£13 12s. 6d. per ton, f.o.r. London.
 SULPHUR.—£10 to £12 per ton, according to quality.
 SULPHUR CHLORIDE.—4d. to 7d. per lb., carboys extra
 SULPHUR PRECIP. B. P.—£55 to £60 per ton.
 THIOCARBAMIDE.—2s. 6d. to 2s. 9d. per lb., carriage paid.
 THIOCARBANILIDE.—2s. 1d. to 2s. 3d. per lb.
 VERMILION, PALE OR DEEP.—6s. 10d. to 7s. per lb.
 ZINC SULPHIDE.—8d. to 11d. per lb.

Pharmaceutical and Photographic Chemicals

ACID, ACETIC, PURE, 80%.—£39 per ton ex wharf London in glass containers.
 ACID, ACETYL SALICYLIC.—2s. 3d. to 2s. 5d. per lb.
 ACID, BENZOIC, B.P.2s. to 3s. 3d. per lb., according to quantity.
 Solely ex Gum, 1s. 3d. to 1s. 4d. per oz., according to quantity.

- ACID, BORIC B.P.—Crystal, 36s. to 39s. per cwt.; powder, 40s. to 43s. per cwt.; extra fine powder, 42s. per cwt., according to quantity. Carriage paid any station in Great Britain, in ton lots.
- ACID, CAMPHORIC.—19s. to 21s. per lb.
- ACID, CITRIC.—2s. 1d. to 2s. 2d. per lb., less 5%.
- ACID, GALLIC.—2s. 8d. per lb. for pure crystal, in cwt. lots.
- ACID, PYROGALLIC, CRYSTALS.—7s. 3d. per lb. Resublimed, 8s. 3d.
- ACID, SALICYLIC, B.P. PULV.—1s. 4½d. to 1s. 6d. per lb. Technical.—10½d. to 11½d. per lb.
- ACID, TANNIC B.P.—2s. 8d. to 2s. 10d. per lb.
- ACID, TARTARIC.—1s. 4½d. per lb., less 5%.
- ACETANILIDE.—1s. 5d. to 1s. 8d. per lb. for quantities.
- AMIDOL.—7s. 6d. to 9s. per lb., d/d.
- AMIDOPYRIN.—7s. 9d. to 8s. per lb.
- AMMONIUM BENZOATE.—3s. 3d. to 3s. 6d. per lb., according to quantity. 18s. per lb. ex Gum.
- AMMONIUM CARBONATE B.P.—£36 per ton. Powder, £39 per ton in 5 cwt. casks. Resublimated, 1s. per lb.
- ATROPHINE SULPHATE.—9s. per oz.
- BARBITONE.—5s. 9d. to 6s. per lb.
- BENZONAPHTHOL.—3s. to 3s. 3d. per lb. spot.
- BISMUTH CARBONATE.—9s. 9d. per lb.
- BISMUTH CITRATE.—9s. 3d. per lb.
- BISMUTH SALICYLATE.—8s. 9d. per lb.
- BISMUTH SUBNITRATE.—8s. 3d. per lb.
- BISMUTH NITRATE.—Cryst. 5s. 9d. per lb.
- BISMUTH OXIDE.—12s. 3d. per lb.
- BISMUTH SUBCHLORIDE.—10s. 9d. per lb.
- BISMUTH SUBGALLATE.—7s. 9d. per lb. Extra and reduced prices for smaller and larger quantities of all bismuth salts respectively.
- BISMUTH ET AMMON LIQUOR.—Cit. B.P. in W. Qts. 1s. 0½d. per lb.; 12 W. Qts. 11½d. per lb.; 36 W. Qts. 11d. per lb.
- BORAX B.P.—Crystal, 24s. to 27s. per cwt.; powder, 25s. to 28s. per cwt., according to quantity. Carriage paid any station in Great Britain, in ton lots.
- BROMIDES.—Ammonium, 2s. to 2s. 3d. per lb.; potassium, 1s. 8½d. to 1s. 11½d. per lb.; sodium, 1s. 11d. to 2s. 2d. per lb.; granulated, ½d. per lb. less; all spot. Large quantities at lower rates.
- CALCIUM LACTATE.—B.P., 1s. 2d. to 1s. 3d. per lb.
- CAMPHOR.—Refined flowers, 2s. 11d. to 3s. per lb., according to quantity; also special contract prices.
- CHLORAL HYDRATE.—3s. 2d. to 3s. 4d. per lb.
- CHLOROFORM.—2s. 5½d. to 2s. 7½d. per lb., according to quantity.
- CREOSOTE CARBONATE.—6s. per lb.
- ETHERS.—S.G. 730—11d. to 1s. per lb., according to quantity other gravities at proportionate prices.
- FORMALDEHYDE, 40%.—37s. per cwt., in barrels, ex wharf.
- GUAIACOL CARBONATE.—4s. 6d. to 4s. 9d. per lb.
- HEXAMINE.—1s. 11d. to 2s. 2d. per lb.
- HOMATROPINE HYDROBROMIDE.—30s. per oz.
- HYDRASTINE HYDROCHLORIDE.—English make offered at 120s. per oz.
- HYDROGEN PEROXIDE (12 VOLS.).—1s. 4d. per gallon, f.o.r. makers' works, naked. Winchester, 2s. 11d. per gall. B.P., 10 vols., 2s. to 2s. 3d. per gall.; 20 vols., 4s. per gall.
- HYDROQUINONE.—3s. 9d. to 4s. per lb., in cwt. lots.
- HYPOPHOSPHITES.—Calcium, 2s. 9d. per lb.; potassium, 3s. per lb.; sodium, 2s. 11d. per lb., in 1 cwt. lots, assorted.
- IRON AMMONIUM CITRATE.—B.P., 2s. 8d. to 2s. 11d. per lb. Green, 3s. 1d. to 3s. 4d. per lb. U.S.P., 2s. 9d. to 3s. per lb.
- IRON PERCHLORIDE.—18s. to 20s. per cwt., according to quantity.
- IRON QUININE CITRATE.—B.P., 8½d. to 9½d. per oz., according to quantity.
- MAGNESIUM CARBONATE.—Light commercial, £31 per ton net.
- MAGNESIUM OXIDE.—Light commercial, £62 10s. per ton, less 2½%; Heavy commercial, £21 per ton, less 2½%; in quantity lower; Heavy Pure, 2s. to 2s. 3d. per lb.
- MENTHOL.—A.B.R. recrystallised B.P., 22s. per lb. net; Synthetic, 11s. to 12s. per lb.; Synthetic detached crystals, 11s. to 16s. per lb., according to quantity; Liquid (95%), 9s. 6d. per lb.
- MERCURIALS B.P.—Up to 1 cwt. lots, Red Oxide, crystals, 8s. 4d. to 8s. 5d. per lb., levig., 7s. 10d. to 7s. 11d. per lb.; Corrosive Sublimate, Lump, 6s. 7d. to 6s. 8d. per lb., Powder, 6s. to 6s. 1d. per lb.; White Precipitate, Lump, 6s. 9d. to 6s. 10d. per lb., Powder, 6s. 10d. to 6s. 11d. per lb., Extra Fine, 6s. 11d. to 7s. per lb.; Calomel, 7s. 2d. to 7s. 3d. per lb.; Yellow Oxide, 7s. 8d. to 7s. 9d. per lb.; Persulph, B.P.C., 6s. 11d. to 7s. per lb.; Sulph. nig., 6s. 8d. to 6s. 9d. per lb. Special prices for larger quantities.
- METHYL SALICYLATE.—1s. 3d. to 1s. 6d. per lb.
- METHYL SULPHONAL.—8s. 9d. to 9s. per lb.
- METOL.—9s. to 11s. 6d. per lb. British make.
- PARAFORMALDEHYDE.—1s. 9d. per lb. for 100% powder.
- PARALDEHYDE.—1s. 4d. per lb.
- PHENACETIN.—2s. 5d. to 2s. 8d. per lb.
- PHENAZONE.—3s. 9d. to 4s. per lb.
- PHENOLPHTHALEIN.—6s. to 6s. 3d. per lb.
- POTASSIUM BITARTRATE 99/100% (Cream of Tartar).—97s. per cwt., less 2½ per cent.
- POTASSIUM CITRATE.—B.P.C., 2s. 6d. to 2s. 9d. per lb.
- POTASSIUM FERRICYANIDE.—1s. 9d. per lb., in cwt. lots.
- POTASSIUM IODIDE.—16s. 8d. to 17s. 2d. per lb., according to quantity.
- POTASSIUM METABISULPHITE.—6d. per lb., 1-cwt. kegs included f.o.r. London.
- POTASSIUM PERMANGANATE.—B.P. crystals, 5½d. per lb., spot.
- QUININE SULPHATE.—1s. 8d. to 1s. 9d. per oz., bulk in 100 oz. tins.
- RESORCIN.—2s. 10d. to 3s. per lb., spot.
- SACCHARIN.—47s. per lb.; in quantity lower.
- SALOL.—2s. 3d. to 2s. 6d. per lb.
- SODIUM BENZOATE, B.P.—1s. 8d. to 1s. 11d. per lb.
- SODIUM CITRATE, B.P.C., 1911.—2s. 3d. to 2s. 6d. per lb., B.P.C. 1923.—2s. 8d. to 2s. 9d. per lb. U.S.P., 2s. 6d. to 2s. 9d. per lb., according to quantity.
- SODIUM FERROCYANIDE.—4d. per lb., carriage paid.
- SODIUM HYPOSULPHITE, PHOTOGRAPHIC.—£15 per ton, d/d consignee's station in 1-cwt. kegs.
- SODIUM NITROPRUSSIDE.—16s. per lb.
- SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).—95s. to 100s. per cwt. Crystals, 5s. per cwt. extra.
- SODIUM SALICYLATE.—Powder, 1s. 6d. to 1s. 7d. per lb. Crystal, 1s. 7d. to 1s. 8d. per lb.
- SODIUM SULPHIDE, PURE RECRYSTALLISED.—10d. to 1s. 1d. per lb.
- SODIUM SULPHITE, ANHYDROUS.—£27 10s. to £28 10s. per ton, according to quantity. Delivered U.K.
- SULPHONAL.—6s. 6d. to 6s. 9d. per lb.
- TARTAR EMETIC, B.P.—Crystal or powder, 2s. 1d. to 2s. 3d. per lb.
- THYMOL.—Puriss., 9s. 1d. to 9s. 4d. per lb., according to quantity. Firmer. Natural, 12s. 6d. per lb.

Perfumery Chemicals

- ACETOPHENONE.—6s. 6d. per lb.
- AUBEPINE (EX ANETHOL).—11s. per lb.
- AMYL ACETATE.—2s. 6d. per lb.
- AMYL BUTYRATE.—4s. 6d. per lb.
- AMYL SALICYLATE.—2s. 9d. per lb.
- ANETHOL (M.P. 21/22° C.).—5s. 3d. per lb.
- BENZYL ACETATE FROM CHLORINE-FREE BENZYL ALCOHOL.—1s. 10d. per lb.
- BENZYL ALCOHOL FREE FROM CHLORINE.—1s. 10d. per lb.
- BENZALDEHYDE FREE FROM CHLORINE.—2s. 6d. per lb.
- BENZYL BENZOATE.—2s. 3d. per lb.
- CINNAMIC ALDEHYDE NATURAL.—15s. 6d. per lb.
- COUMARIN.—8s. 6d. per lb.
- CITRONELLOL.—10s. per lb.
- CITRAL.—8s. 3d. per lb.
- ETHYL CINNAMATE.—6s. per lb.
- ETHYL PHTHALATE.—2s. 9d. per lb.
- EUGENOL.—14s. per lb.
- GERANIOL (PALMAROSA).—22s. per lb.
- GERANIOL.—6s. 6d. to 10s. per lb.
- HELIOTROPINE.—5s. per lb.
- ISO EUGENOL.—16s. per lb.
- LINALOL.—Ex Bois de Rose, 12s. 6d. per lb. Ex Shui Oil, 9s. per lb.
- LINALYL ACETATE.—Ex Bois de Rose, 16s. 6d. per lb. Ex Shui Oil Linalol, 10s. per lb.
- METHYL ANTHRANILATE.—8s. per lb.
- METHYL BENZOATE.—4s. per lb.
- MUSK KETONE.—34s. per lb.
- MUSK XYLOL.—7s. per lb.
- NEROLIN.—3s. 9d. per lb.
- PHENYL ETHYL ACETATE.—11s. per lb.
- PHENYL ETHYL ALCOHOL.—10s. per lb.
- RHODINOL.—52s. per lb.
- SAFROL.—2s. per lb.
- TERPINEOL.—1s. 6d. per lb.
- VANILLIN, EX CLOVE OIL.—18s. 6d. per lb. Ex Geraniol, 15s. 6d. per lb.

Essential Oils

- ALMOND OIL.—Foreign S.P.A., 9s. 6d. per lb.
- ANISE OIL.—2s. 9d. per lb.
- BERGAMOT OIL.—23s. 6d. per lb.
- BOURBON GERANIUM OIL.—21s. per lb.
- CAMPHOR OIL.—1s. per lb.
- CANANGA OIL, JAVA.—11s. per lb.
- CASSIA OIL, 80/85%.—6s. per lb.
- CINNAMON OIL LEAF.—9s. 3d. per oz.
- CITRONELLA OIL.—Java, 2s. per lb., c.i.f. U.K. port. Ceylon, pure, 2s. 2d. per lb.
- CLOVE OIL (90/92%).—11s. per lb.
- EUCALYPTUS OIL, AUSTRALIAN, B.P. 70/75%.—1s. 10½d. per lb.
- LAVENDER OIL.—Mont Blanc, 38/40%, 17s. 6d. per lb.
- LEMON OIL.—19s. per lb.
- LEMONGRASS OIL.—4s. per lb.
- ORANGE OIL, SWEET.—26s. 6d. per lb.
- OTTO OF ROSE OIL.—Anatolian, 35s. per oz. Bulgarian, 75s. per oz.
- PALMA ROSA OIL.—13s. per lb.
- PEPPERMINT OIL.—English, 87s. 6d. per lb.; Wayne County, 14s. 9d. per lb.; Japanese, 7s. 9d. per lb.
- PETITGRAIN.—10s. per lb.
- SANDALWOOD.—Mysore, 28s. per lb.; 90/95%. 18s. 9d. per lb.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.

London, March 21, 1929.

The steady conditions continue, and the amount of business booked during the week, both for home and export, has been very satisfactory.

General Chemicals

ACETONE is firm at £75 to £85 per ton, according to quantity, and in good demand.
ACETIC ACID.—Unchanged at £36 10s. per ton for 80% technical and £37 per ton for 80% pure.
ACID CITRIC.—Unchanged at 2s. 1d. to 2s. 3d. per lb., with a little firmer position.
ACID FORMIC.—At £43 10s. per ton for 85%, and in fair demand.
ACID LACTIC.—Unchanged at £43 per ton for 50% by wt. technical.
ACID OXALIC is firm at £30 10s. to £32 10s. per ton and in good demand.
ACID TARTARIC is very firm at 1s. 4½d. per lb., less 5%.
ALUMINA SULPHATE continues firm and in short supply, especially for early delivery, price unchanged at £7 10s. to £8 per ton.
AMMONIUM CHLORIDE is firm and in active demand.
ARSENIC is unchanged at £16 5s. per ton at the mines.
BARIUM CHLORIDE is still short for early delivery and price firm at £11 10s. to £12 per ton, with a brisk demand.
CREAM OF TARTAR.—Prices have advanced by £1 per ton to £94 to £98 10s. per ton for B.P. 99/100% with a very firm position.
COPPER SULPHATE.—Price nominal at £29 to £31 per ton.
FORMALDEHYDE is in brisk demand and firm at £39 per ton.
LEAD ACETATE.—Owing to the increase in the price of lead, the price of this article has been advanced by £2 per ton and is very firm at £44 10s. per ton for white and £43 10s. per ton for brown.
LEAD NITRATE.—Price nominal at £38 per ton.
LIME ACETATE.—The demand for this article continues very active with short supply. Price unchanged and firm at £18 per ton for grey.
LITHOPONE.—£19 15s. to £22 per ton, according to quantity.
METHYL ACETONE.—In brisk demand at £58 to £60 per ton, with a firm position.
POTASSIUM CARBONATE AND CAUSTIC.—Unchanged.

Nitrogen Products

THE demand for sulphate of ammonia for prompt shipment continues satisfactory, and the price remains unchanged at £10 2s. per ton, f.o.b. U.K. ports, in single bags. According to all Continental advices, the consumption of all forms of nitrogen is proceeding satisfactorily. At present there is very little interest in forward positions, but quotations well below present prices have been made from a small amount of business.

Home.—A heavy volume of buying is reported in the home market. It is understood that producers had large stocks available, and that deliveries have been proceeding satisfactorily.

Nitrate of Soda.—This product is in increasing demand at scale prices in Continental markets. Now that the weather is good, the move out is very satisfactory.

South Wales By-Products

A SURPRISING aspect of South Wales by-product activities at present is the weakness in the demand for patent fuel. Usually the demand for fuel keeps pace with the coal demand, and fuel manufacturers, in view of the recent strengthening of the coal market, anticipated a substantial increase in fuel demands. This, however, has not materialised. Pitch continues to have a quiet demand, and makers are competing keenly for available orders. Prices are unchanged on the basis of 32s. to 33s. per ton, f.o.b., or 34s. to 36s. per ton delivered. Road tar has only a weak call, and values are easier at 10s. to 13s. per 40-gallon barrel. Crude tar is being quoted at 29s. to 31s. per ton, and has a steady, if moderate, demand. Creosote remains weak, and values are unchanged. Motor benzol maintains the advance made following the rise in petrol prices. Crude naphthalene is quiet, with values unchanged at about 80s. per ton, and a similar remark applies to whizzed, round the 100s. per ton mark. Refined tars continue to have a steady call, but values are unchanged, coke oven tar being quoted at 7d. to 7½d. per gallon delivered, and gasworks tar at from 6½d. to 6¾d. per gallon delivered. Patent fuel prices are unchanged, quotations being 21s. to 21s. 6d. per ton ex ship Cardiff; 19s. 3d. to 19s. 6d. ex ship Swansea. Coke prices are: best foundry, 32s. 6d. to 36s. 6d.; good foundry, 26s. 6d. to 32s. 6d.; and furnace, 19s. to 21s. per ton. Oil imports into

POTASSIUM CHLORATE continues firm at £28 to £30 per ton and in steady demand.

POTASSIUM PERMANGANATE.—Steady at 5½d. per lb. for B.P.

POTASSIUM PRUSSIAN.—Unchanged at £63 10s. to £65 10s. per ton and with a very firm position.

SODIUM ACETATE is unchanged at £21 5s. to £22 5s. per ton, according to quantity with a firm position and active demand.

SODA BICROMATE.—Firm at 3½d. per lb., less 2½% with rebates for contracts and in steady demand.

SODIUM CHLORATE is in good demand at £25 per ton.

SODIUM HYPOSULPHITE.—Unchanged at British Makers' prices.

SODIUM NITRITE.—In steady demand at about £20 per ton.

SODIUM PHOSPHATE.—At £12 per ton for Di-Basic and £17 per ton for Tri-Basic and in steady demand.

SODIUM PRUSSIAN is firm at 4½d. to 5½d. per lb., according to quantity.

SODIUM SULPHIDE.—Unchanged at British makers' prices.

TARTAR Emetic is rather slow at 10½d. per lb.

ZINC SULPHATE.—At £12 10s. per ton and in steady demand.

Coal Tar Products

The market for coal tar products remains very quiet, and prices are practically unchanged. In view of the uncertainty of the petrol market, benzols, solvent naphtha, etc., are very unsettled, and manufacturers are inclined to hold.

MOTOR BENZOL is quoted at about 1s. 8½d. per gallon, f.o.r. makers' works.

SOLVENT NAPHTHA is quoted at 1s. 3d. per gallon, f.o.r. makers' works.

HEAVY NAPHTHA is being quoted at 1s. 2½d. per gallon.

CREOSOTE OIL remains weak, being quoted at 4½d. per gallon on rails in the North, and at 5½d. per gallon in London.

CRESYLIC ACID remains unchanged, the 98/100% quality being quoted at about 1s. 10d. per gallon, and the dark quality 95/97% at about 1s. 8d. per gallon, f.o.r.

NAPHTHALENES.—The firelighter quality remains at about £4 10s. per ton, the 74/76 quality at £5 per ton, and the 76/78 quality at £6 to £6 5s. per ton.

PITCH.—There is little demand, and the market remains weak, at 30s. to 32s. 6d. per ton, f.o.b.

Swansea over the last four ascertainable weeks amounted to 38,009,090 gallons, a substantial advance on the imports of recent four-week periods.

Latest Oil Prices

LONDON, March 20.—LINSEED OIL steady. Spot, ex mill, £29; March, £28 2s. 6d.; April, £28 7s. 6d.; May-August, £28 15s.; September-December, £29 7s. 6d., naked. RAPE OIL was quiet. Crude extracted, £42; technical refined, £44, naked, ex wharf. COTTON OIL was slow. Egyptian crude, £28 10s.; refined common edible, £34; deodorised, £36, naked, ex mill. TURPENTINE was firm and a further 3d. per cwt. higher. American, spot, 45s. 6d.; April and May, 45s. 9d.

HULL.—LINSEED OIL.—Spot and March, £28 10s.; April, £28 12s. 6d.; May-August, £28 15s.; September-December, £29 2s. 6d. per ton, naked. COTTON OIL.—Bombay, crude, spot, £27 10s.; Egyptian, crude, spot (new) and March and April, £28; edible refined, spot, March and April, £31 10s.; technical, spot, £31; deodorised, spot, £33 10s. per ton, naked. PALM KERNEL OIL.—Crude, 5½ per cent., £35 10s.; naked. GROUNDNUT OIL.—Crushed-extracted, £34; deodorised, £38 per ton. SOYA OIL.—Extracted and crushed, £30 10s.; deodorised, £34 per ton. RAPE OIL.—Crushed-extracted, £42 10s.; refined, £44 10s. per ton. TURPENTINE.—Spot, 48s. per cwt., net cash terms, ex mill. CASTOR OIL and COD OIL unchanged.

Developments of British Chemical Manufactures

A PUBLIC MEETING on the above subject will be held, under the auspices of the British Science Guild, in the Mansion House, London, on Wednesday, April 24, at 4:30 p.m., when Lord Melchett (president of the Guild) will take the chair. The programme will include the following addresses:—"Fertilisers from the Air," by Sir Frederick Keeble (of Imperial Chemical Industries, Ltd.); "Rayon (Artificial Silk)," by A. B. Shearer (of Courtaulds, Ltd.); and "Synthetic Drugs," by Francis H. Carr (of The British Drug Houses, Ltd.). Tickets for the meeting may be obtained on application to the British Science Guild, 6, John Street, Adelphi, London, W.C.2.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, March 20, 1929.

SINCE our last report business in the heavy chemical market has appreciably improved, good inquiry going around both for home and export business, with the proportion of orders in relation to inquiry better than for some little time. Prices remain fairly steady; a notable exception is antimony oxide, which is quoted almost £2 per ton dearer for prompt shipment.

Industrial Chemicals

- ACETONE, B.G.S.—£76 10s. to £85 per ton ex wharf, according to quantity. Inquiry remains satisfactory.
- ACID ACETIC, 98/100%—Glacial £56 to £67 per ton, according to quality and packing, c.i.f. U.K. ports; 80% pure, £37 10s. per ton, ex wharf; 80% technical, £37 10s. per ton, ex wharf.
- ACID BORIC.—Crystals, granulated or small flakes, £30 per ton. Powder, £38 per ton, packed in bags carriage paid U.K. stations. There are few fairly cheap offers made from the Continent.
- ACID CARBOLIC, ICE CRYSTALS.—Unchanged at 6½d. per lb., delivered or f.o.b. U.K. ports.
- ACID CITRIC, B.P. CRYSTALS.—Quoted 2s. 2½d. per lb., less 5% ex store, spot delivery. Offered at 2s. 2½d. per lb. less 5% ex wharf, prompt shipment from the Continent.
- ACID HYDROCHLORIC.—Usual steady demand. Arsenical quality 4s. per carboy. Dearsenicated quality 5s. 6d. per carboy ex works, full wagon loads.
- ACID NITRIC, 80° QUALITY.—£24 10s. per ton, ex station, full truck loads.
- ACID OXALIC, 98/100%.—Price remains unchanged at about 3½d. per lb., ex store. Offered for prompt shipment from the Continent at 3½d. per lb., ex wharf.
- ACID SULPHURIC.—£2 15s. per ton ex works for 144° quality; £5 15s. per ton for 168° quality. Dearsenicated quality 20s. per ton extra.
- ACID TARTARIC, B.P. CRYSTALS.—Spot material now quoted 1s. 4½d. per lb., less 5% ex wharf.
- ALUMINA SULPHATE.—Spot material rather dearer at about £6 per ton, ex store, for prompt shipment £5 15s. per ton, c.i.f. U.K. ports.
- ALUM, LUMP POTASH.—Unchanged at about £8 12s. 6d. per ton, c.i.f. U.K. ports. Crystals Meal offered on spot at £9 per ton, ex store.
- AMMONIA ANHYDROUS.—Quoted 9½d. per lb., carriage paid, containers extra and returnable.
- AMMONIA CARBONATE.—Lump quality quoted £36 per ton. Powdered £38 per ton, packed in 5 cwt. casks delivered U.K. stations or f.o.b. U.K. stations.
- AMMONIA LIQUID, 88°.—Unchanged at about 2½d. to 3d. per lb., delivered, according to quantity.
- AMMONIA MURIATE.—Grey galvanizers crystals of British manufacture quoted £21 to £22 per ton, ex station. Fine white crystals offered from the Continent at about £17 5s. per ton, c.i.f. U.K. ports.
- ANTIMONY OXIDE.—Now quoted £37 10s. per ton, c.i.f. U.K. ports, prompt shipment from China. Spot material still on offer at £40 per ton, ex store.
- ARSENIC, WHITE POWDERED.—Rather easier and now quoted £18 5s. per ton, ex wharf, prompt despatch from mines. Spot material still quoted £19 15s. per ton, ex store.
- BARIUM CHLORIDE.—On offer from the Continent at £10 5s. per ton, c.i.f. U.K. ports.
- BLEACHING POWDER.—British manufacturers contract price to consumers unchanged at £6 12s. 6d. per ton, delivered in minimum 4 ton lots. Continental now offered at about the same figure.
- CALCIUM CHLORIDE.—Remains unchanged. British manufacturers price £4 5s. to £4 15s. per ton, according to quality and point of delivery. Continental material on offer at £3 12s. 6d. per ton, c.i.f. U.K. ports.
- COPPERAS, GREEN.—Unchanged at about £3 10s. per ton, f.o.r. works or £4 12s. 6d. per ton, f.i.b. U.K. ports.
- COPPER SULPHATE.—Steady and price about £25 15s. per ton, ex wharf.
- FORMALDEHYDE, 40%.—Good inquiry and price unchanged at about £37 10s. per ton, ex store.
- GLAUBER SALTS.—English material quoted £4 10s. per ton, ex station. Continental on offer at about £3 5s. per ton, ex wharf.
- LEAD, RED.—On offer at £29 15s. per ton, ex store.
- LEAD, WHITE.—Quoted £37 10s. per ton, c.i.f. U.K. ports.
- LEAD ACETATE.—White crystals quoted £41 10s. per ton. Brown on offer about £39 10s. per ton, ex store.
- MAGNESITE, GROUND CALCINED.—Quoted £8 10s. per ton, ex store. In moderate demand.
- METHYLATED SPIRIT.—Industrial quality 64 O.P. quoted 1s. 4d. per gallon, less 2½% delivered.
- POTASSIUM BICHROMATE.—Quoted 4½d. per lb., delivered U.K. or c.i.f. Irish ports, with an allowance of 2½% for minimum, 2½ tons to be taken.
- POTASSIUM CARBONATE, 96/98%.—Spot material now quoted £26 10s. per ton, ex store. Offered from the Continent, £25 10s. per ton, c.i.f. U.K.
- POTASSIUM CHLORATE, 99½/100%.—Powder quoted £25 10s. per ton, ex wharf. Crystals, 30s. per ton extra.
- POTASSIUM NITRATE.—Refined granulated quality quoted £19 2s. 6d. per ton, c.i.f. U.K. ports. Spot material on offer at about £20 10s. per ton, ex store.
- POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Quoted 5½d. per lb., ex wharf.
- POTASSIUM PRUSSIAN (YELLOW).—Offered for prompt shipment from the Continent at 6½d. per lb., ex wharf. Spot material quoted 7d. per lb., ex store.
- SODA CAUSTIC, POWDERED, 98/99%.—Now £17 10s. per ton, in drums, £18 15s. per ton in casks. Solid, 86/77%, £14 10s. per ton in drums. 70/72%, £14 2s. 6d. per ton in drums, all carriage paid buyers stations, minimum 4-ton lots, for contracts 10s. per ton less.
- SODIUM ACETATE.—65% crystals quality quoted about £19 15s. per ton, ex wharf; 73/78% anhydrous quality on offer at £20. per ton, carriage paid, buyer's stations.
- SODIUM BICARBONATE.—Refined recrystallised £10 10s. per ton, ex quay or station. M.W. quality, 30s. per ton less.
- SODIUM BICHROMATE.—3½d. per lb. delivered U.K. or c.i.f. Irish ports, less 2½% for contract, minimum 2½ tons.
- SODIUM CARBONATE (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station. Powdered or pea quality, 27s. 6d. per ton extra. Light soda ash, £7 1s. 3d. per ton, ex quay, minimum 4-ton lots with various reductions for contracts.
- SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £8 17s. 6d. per ton, ex station, minimum 4-ton lots; pea crystals on offer at £14 15s. per ton, ex station, minimum 4-ton lots. Prices for this year unchanged.
- SODIUM NITRATE.—Ordinary quality quoted £10 12s. per ton, carriage paid buyers' sidings, minimum 6-ton lots, usual extras for small quantities and refined qualities.
- SODIUM SULPHATE (SALTCAKE).—Prices, 50s. per ton, ex works, 52s. 6d. per ton, delivered for unground quality. Ground quality, 2s. 6d. per ton extra.
- SODIUM SULPHIDE.—Prices for home consumption. Solid, 60/62%, £9 per ton. Broken, 60/62%, £10 per ton. Crystals, 30/32%, £7 2s. 6d. per ton, delivered buyers' works on contract, minimum 4-ton lots. Special prices for some consumers. Spot material 5s. per ton extra.
- SULPHUR.—Flowers, £12 per ton; roll, £10 10s. per ton; rock, £10 7s. 6d. per ton; ground American, £9 5s. per ton; ex store.
- ZINC CHLORIDE, 98%.—British material now quoted £22 10s. per ton, f.o.b. U.K. ports.
- ZINC SULPHATE.—Offered from the Continent at about £10 5s. per ton, ex wharf.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable to small parcels.

Large Bequest for Cambridge University

THE will of Mr. John Humphrey Plummer, of Lord Street, Southport, has now been proved at £271,788 gross. Mr. Plummer left bulk of his estate (about £200,000) to the University of Cambridge. After minor bequests, he gave all other of his property upon trust in perpetuity for the promotion and encouragement of education in chemistry, biochemistry, physical science, or such other allied subjects in the University of Cambridge as his trustees may think fit. He stated that his desire and intention was that as soon as the income should become available, his trustees should establish and endow a chair or chairs or a professorship or professorships, each of the annual value of £1,200, in accordance with a scheme to be agreed between his trustees and the governing body of the university, and directing that the benefit should be known as the John Humphrey Plummer Foundation or some similar term.

Manchester Chemical Market

(FROM OUR OWN CORRESPONDENT.)

Manchester, March 21, 1929.

CONTRACT deliveries of chemicals to consumers in this district show no sign of falling away, and are likely to expand with any marked improvement in cotton trade conditions. For the most part, transactions in chemicals in the open market are not large individually, although of fair bulk in the aggregate. Quotations remain very firm all round. The advance in copper and lead this week has created a good deal of embarrassment to both buyers and sellers of the compounds of those metals, and values are largely nominal.

Heavy Chemicals

Phosphate of soda is only in moderate request, but prices in this section are steady at about £12 5s. per ton. There is a fair business passing in the case of prussiate of soda which keeps very firm at the range of 4½d. to 5d. per lb., according to quantity. Bichromate of soda, also, is well held on the basis of 3½d. per lb., and inquiry for this material is reasonably satisfactory. Chlorate of soda meets with a quiet demand, with current offers at about 2½d. per lb. Sales of bleaching powder are on moderate lines at round £7 per ton. The demand for caustic soda is of a fairly regular character, and values are firm, at from £12 15s. to £14 per ton, in contracts. There has not been a great deal of business done in sulphide of sodium during the week, though prices keep up at about £8 per ton for the commercial grade and £9 10s. for the 60-65 per cent. concentrated solid. Hyposulphite of soda, also, is on the quiet side at £9 per ton for the commercial material and £15 5s. per ton for the photographic. Alkali is fully maintained at about £6 per ton and a steady trade is being put through. Saltcake meets with a quiet demand, with offers at from £2 10s. to £2 12s. 6d. per ton. With regard to bicarbonate of soda, buying interest in this material is fairly active, and prices are unchanged at round £10 10s. per ton.

Only a comparatively quiet business has been reported this week in the case of permanganate of potash, though values are pretty much as they were, with B.P. quoted at 5½d. per lb. and the commercial grade at about 5½d. A quiet trade is being done in chlorate of potash at steady prices, from 3d. to 3½d. per lb. having been quoted here during the past week. The demand for carbonate of potash is on fairly regular lines, and prices are maintained at from £26 to £26 5s. per ton. There has been a moderate inquiry about for caustic potash, offers of which keep firm at from £33 5s. per ton for prompt delivery of one to five-ton lots. Bichromate of potash meets with a fair volume of inquiry, and values are well held on the basis of 4½d. per lb. Sales of yellow prussiate of potash are of moderate extent, with quotations ranging from 6½d. to 7½d. per lb., according to quantity.

The marked rise in copper early in the week has made its influence felt on sulphate of the metal, and values at the moment are largely nominal, with buying operations on extremely cautious lines. A quiet trade is passing in the case of arsenic, offers of which are still in the neighbourhood of £16 5s. per ton, at the mines, for white powdered, Cornish makes. The acetates of lime remain firm, although not particularly active at about £17 per ton for the grey quality and from £8 15s. to £9 for the brown. With regard to the acetates of lead, these also are more or less nominal in consequence of the advance in the metal. Nitrate of lead is firmer on the week at round £35 per ton.

Acids and Tar Products

The demand for oxalic acid continues on somewhat narrow lines, but prices are about maintained at £1 11s. 6d. per cwt. Tartaric acid is attracting a fair amount of attention and quotations are firm at from 1s. 4½d. per lb. With regard to citric acid, this is meeting with a moderate amount of inquiry, and quotations are steady at up to 2s. 3d. per lb. A steady trade is being put through in acetic acid, offers of which are very firm at round £36 per ton for the 80 per cent. commercial grade and £66 per ton for the glacial.

In the by-products section of the market, pitch is relatively quiet still and prices easy at £1 12s. 6d. per ton, f.o.b. The movement of creosote oil, also, is on a small scale and at round

3½d. per gallon, naked, values are anything but strong. Carbolic acid crystals meet with a steady demand and up to 6½d. per lb., f.o.b., is now being asked. Crude 60's carbolic is maintained at about 1s. 10d. per gallon, naked. Solvent naphtha is in moderate request at about 1s. 3d. per gallon.

A Benn Brothers Jubilee Dinner

To celebrate the jubilee of *Gardening Illustrated*, one of the many weekly journals published by Benn Brothers, Sir Ernest Benn gave a commemorative dinner, which had several notable features, on Friday evening, at the Hotel Cecil. The guests, numbering about 70, included the editors and managers of the firm's journals, representatives of Ernest Benn, Ltd., and the Trade Promotion Trust, several directors of the firm, and a few outside visitors like Sir Donald Maclean.

In proposing the toast of *Gardening Illustrated*, Sir Ernest Benn said that the statistical department informed him that the combined ages of all the Benn journals was 533 years, and that figure also, curiously enough, represented the combined ages of their editors and editresses (laughter). 533 years took them back to the year 1396, which might, therefore, be considered their birth year, and, which he was authentically told, marked the end of the Dark Ages, the beginning of the Renaissance, and the start of "such civilisation as we have amongst us." (Laughter.)

Referring to *Gardening Illustrated*, he said that the founder and first editor, Mr. William Robinson, was still alive, in his 92nd year, and so far he had only had two successors in the editorial chair, their fine old Scottish friend Thompson, who died a few years ago, and the present editor, Mr. H. Cowley. Robinson founded the journal with the idea of raising the standard of gardening, just as his father, the late Sir John Benn, risked his all in starting the *Cabinet Maker* in 1880 to lead a revolt against the atrocities of Victorian furnishing.

The toast was responded to by Mr. H. Cowley (editor) and Mr. H. W. Duck (manager), and then followed a series of toasts proposed and acknowledged by the following members of the staffs:—"Literature," Mr. H. B. Crole-Rees (managing director) and Captain E. W. Gregory (*Cabinet Maker*); "The Art of Advertising," Mr. Norman French (*Hardware Trade Journal*) and Mr. E. H. Hallows (*The Gas World*); "The Firm," Mr. L. J. Moolenaar (*THE CHEMICAL AGE*), and Mr. John Benn (*Discovery*).

In adding a final toast, "The Chairman," Mr. Gordon Robbins remarked that as the health of Sir Ernest Benn was of the greatest importance to the firm, it was appropriate to couple the toast with the name of the lady who did most to look after it. Lady Benn, who was very cordially received, acknowledged the toast in one of her happiest little speeches.

Chemists' Dinner in Newcastle

A JOINT dinner of the local sections of the Society of Chemical Industry, Institute of Chemistry, and the Newcastle Chemical Industry Club, was held last week in Newcastle, under the chairmanship of Professor Briscoe. Following the toast of "The King," Mr. B. P. Hill proposed "The Society of Chemical Industry." He remarked that they had three bodies represented at their gathering, each contributing a great deal to building up their great chemical industry. Mr. H. Dunford Smith, who replied, hoped that in the days to come those separate societies would be merged into the Society of Chemical Industry. Dr. P. E. Bowles gave "The Institute of Chemistry," which, he said, had done, in a quiet and unobtrusive fashion, very good work. It deserved a fair amount of credit for the status which it had given the chemist. He paid tribute to the work of Professor Briscoe. Professor Briscoe replied and said it was a matter for regret that Dr. Bowles was leaving the district for London. The toast of "The Newcastle Chemical Industry Club" was proposed by Mr. W. Diamond, and responded to by Mr. R. Bowran. The following officers for the Society of Chemical Industry were elected for the ensuing year:—Chairman, Professor H. V. A. Briscoe; vice-chairman, Mr. A. Rudge; honorary treasurer, Mr. N. Dawson; honorary secretary, Mr. F. Hirsch.

Company News

BARROW, HEPBURN AND GALE.—The accounts for 1928 show a net debit of £154,817. After deducting a credit of £23,520 brought forward, there is an adverse balance to carry forward of £131,297.

THARSIS SULPHUR & COPPER CO.—The directors recommend a dividend of £10 per cent. for 1928, against 8½ per cent. for 1927, placing to reserve £25,000 against nothing, carrying forward £82,139 against £85,110.

CHESHIRE UNITED SALT CO.—The directors state that the average profit, subject to allowance for interest charges and London office expenses, for the six months ended December 31 last, was £628 per month. The profit for January, 1929, was £844, with the output 22 per cent. greater than the monthly average for 1928.

TEHDY MINERALS.—The report for the year ended December 31, 1928, states that the profit was £12,954, to which is added the balance brought forward of £5,195, making £18,149. The directors recommend a final dividend of 3d. per share, free of income-tax, making 9d. per share for year, and directors' commission thereon £184, leaving £6,941 to be carried forward.

SALT UNION, LTD.—The accounts for the past year show a profit of £229,882, which, after adding £32,398 brought forward from 1927, and deducting debenture interest for the year, leaves a surplus of £219,983. A dividend of 2s. 6d. per share is proposed on the ordinary shares, placing £25,000 to contingencies account, and £1,000 to staff superannuation fund, and carrying forward £23,983.

BARRY, OSTLERE AND SHEPHERD, LTD.—The directors have decided to recommend a final dividend of 10 per cent., making, with the 5 per cent. interim dividend, 15 per cent. for the year, and a bonus of 2s. per share, both less tax, on the ordinary shares, the same as for 1927. The sum of £40,000 has been placed to reserve, against £65,000, and £128,821 is carried forward, compared with £116,030 for the previous year.

HADFIELDS, LTD.—A profit of £112,053 is reported for 1928, which compares with £187,223 for 1927. With £86,366 brought forward, there is £198,419. Interest on mortgage debenture stock absorbed £57,152, and the dividend on the preference shares £13,500, leaving £127,767. The board recommend a dividend on the ordinary shares of 2½ per cent., less tax, as compared with 5 per cent. for 1927, leaving £90,571 to be carried forward.

BEDE METAL AND CHEMICAL CO.—Operations for the year 1928 have resulted in a profit (after writing off depreciation at Hepburn, £5,000, and in Norway, £3,029) of £30,862, to which is added the net amount brought forward £4,226, making £35,088. The directors recommend a final dividend of 1s. 3d. per share (less tax), making 1s. 6d. per share for the year, placing to general reserve £10,000, reserve for replacements £6,000, leaving to be carried forward £6,003.

BRITON FERRY CHEMICAL AND MANURE.—After providing £3,325 for income tax and charging £10,000 for depreciation and £4,599 for dividend on preference shares, and transferring £5,000 to reserve account, the report for 1928 states that there remains a credit balance at profit and loss, including balance from previous year, of £10,073, out of which the directors recommend payment on March 30 next a dividend of 1s. per share, less tax, on the ordinary shares.

POWELL DUFFRYN STEAM COAL CO., LTD.—The company report a loss of £35,656 for the past year. Interest on debenture stock and notes accounts for £196,149, making £231,805. A credit balance, however, was brought forward, £23,900, leaving a debit balance of £207,905 to be carried forward. The directors regret they are unable to recommend any dividend upon the preference, second preference, and ordinary share capital of the company for the year under review.

RECKITT AND SONS.—The net trading profits for the year ended December 31 last amount to £1,229,612. The directors recommend that £148,692 be transferred to the reserve fund, making the reserve £1,500,000; that £100,000 be transferred to the development fund. They also recommend the payment of a final dividend of 2s. per share on the ordinary shares, making the dividend 21½ per cent. for the year, and that a bonus of £101,875 be paid to the staff and workpeople, carrying forward £92,035.

MAGADI SODA CO.—The following dividends are announced payable on April 5, less tax:—6% per annum on the first and the second cumulative preference shares, for the two years ended December 31, 1928; and 12½% on the preferred ordinary shares for the year ended December 31, 1928. These are the first dividends to be paid by the company except for the small payment of 0.768 per cent. on June 30, 1927, on the first preference shares. The company is controlled by Imperial Chemical Industries.

PINCHIN, JOHNSON AND CO.—For the past year the net profits were £422,796, and £52,272 was brought forward. After making provision for income tax to April 5, 1929, and half-yearly dividend on the preference shares to June 30, 1928, and interim dividend of 10 per cent. on the ordinary shares, there remains £325,697. The directors recommend half-yearly dividend on preference shares (paid January 1, 1929) and a dividend of 20 per cent. on the ordinary shares now issued, including dividend on 6,000 ordinary shares issued since December 31, 1928 (absorbing £165,549), placing £67,000 to the reserve fund and carrying forward £80,102.

WILLIAM GOSSAGE AND SONS.—The report for the year ended November 30 states that during the year certain reserves no longer required have been transferred to general reserve, and £200,000, forming part of company's general reserve, has been distributed among holders of ordinary shares as a capital bonus in form of 20,000 ordinary shares of £10 each credited as fully paid. After providing for all charges, the balance standing at the credit of the profit and loss account at the end of the year is £296,412, to which is added the balance brought forward of £19,231, making a total of £315,643. The directors propose a dividend of 20 per cent. on the ordinary shares, placing to general reserve £75,000 and carrying forward £29,393.

BRITISH DRUG HOUSES, LTD.—The trading profit for the year ended December 31, 1928, was £80,306, as compared with £57,979 for the previous year. After providing for income tax, amortisation of leaseholds and depreciation, and directors' fees, the balance of net profit available is £62,372, against £43,819 for 1927. Adding the brought forward of £7,751, there is a total of £70,123. As announced last week, the directors recommend a dividend of 8 per cent. on the ordinary shares, less income tax, which goes against 6 per cent. last year, placing to general reserve £15,000, being £5,000 more than last time, carrying forward £11,023, against £7,751. The annual meeting will be held at the Midland Hotel, London, on March 25, at 12 noon.

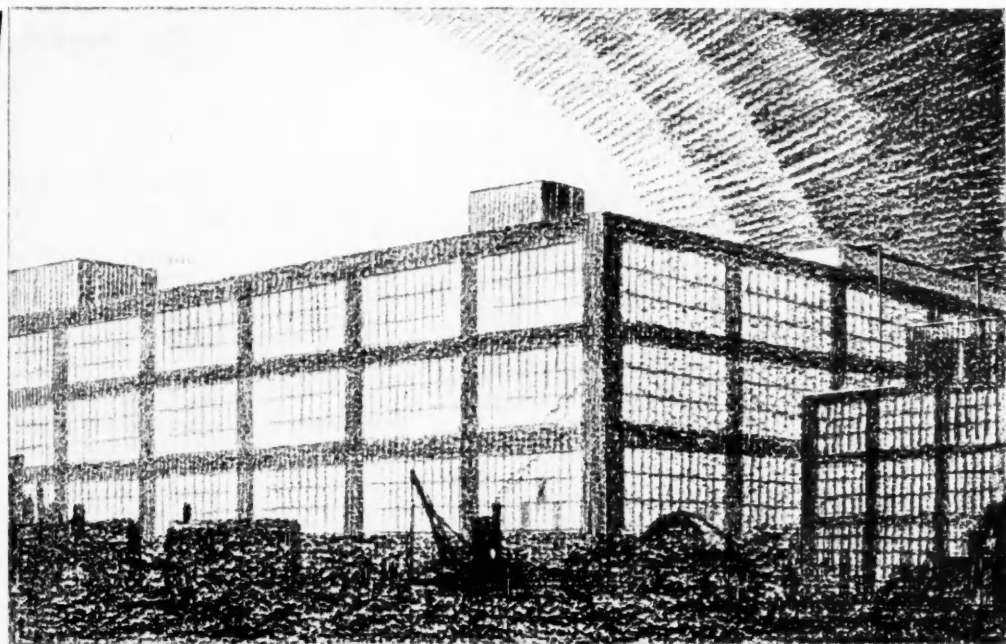
Poison Gas in War

A BERLIN report states that the Foreign Affairs Committee of the Reichstag, on Tuesday, adopted the bill to give effect to the Geneva protocol prohibiting the use of poison gas in war. Herr Von Schubert, the Under Secretary, in recalling that the protocol was signed by thirty-five Powers and had already been ratified by eight countries, pointed out that the protocol was the best means of dispelling any erroneous belief that might exist that Germany had anything to hide in respect of chemical warfare. The German Government, he said, attached great importance to the bill being ratified before the preliminary disarmament conference meets. He added that the ratification had not prevented the further discussion of the question of protection against gas as well as aerial attacks.

Scottish Shale Oil Industry

IN the course of a lecture on oil mining delivered in Workington, Cumberland, on Friday, March 15, Professor Henry Briggs, of Edinburgh University, referred to the present state of the shale mining industry in Scotland. The centre of gravity in oil-shale mining, he said, had moved from Scotland to Estonia. The Scottish industry kept its end up, despite the influx of cheap foreign oil, for nearly eighty years. It was an extraordinary and entirely home-made industry, now, unfortunately, declining. It was a sad sight to see so much experience apparently destined to run to waste, and a mining population of unequalled quality dispersed for ever.

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A modern concrete factory is a perfect illustration of the harnessing of Nature's own light to the specialised needs of modern industry.

T.C.S. Engineers have collaborated and advised on the successful construction of some of the most scientific examples of the housing of modern industrial plant.

Their experience is at your disposal on any problem that you may encounter.

THE TRUSSED CONCRETE STEEL CO. LTD.

*Reinforced Concrete
Engineers*

22 Cranley Gardens. South Kensington. S.W.7.



Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

MATTHEWS AND WILSON, LTD., 15, New Broad Street, E.C., manufacturing chemists. (C.C., 23/3/29.) £10 18s. 1d. January 29, 1929.

Deed of Arrangement

[The following deeds of arrangement with creditors have been filed under the Deeds of Arrangement Act, 1914. Under this Act it is necessary that private arrangements other than those executed in pursuance of the Bankruptcy Act shall be registered within seven clear days after the first execution by the debtor or any creditor. These figures are taken from the affidavit filed with the registered deed, but may be subject to variation on realisation.]

ADCOCK, Robert Page, trading as ACME SOAP AND CHEMICAL CO., 41, Oakfield Street, Cardiff. (D.A., 23/3/29.) Dated March 7, filed March 14. Trustee, F. E. Bendall, 35, Windsor Place, Cardiff, accountant. Secured creditors, £702; liabilities, unsecured, £1,940; assets, less secured claims, £53.

Mortgages and Charges

[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case, the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]

CONSOL PRODUCTS, LTD., Sunbury Common, manufacturers of essences, etc. (M., 23/3/29.)—Registered March 4, £1,500 debentures, part of £10,000 and premium of 5 per cent.; general charge. *£6,500. July 30, 1928.

EAST LANCASHIRE CHEMICAL CO., LTD., Droylsden. (M., 23/3/29.) Registered March 7, £2,000 (not ex.) charge, to Lloyds Bank, Ltd.; charged on premises in Edge Lane, Droylsden.

GIBBS (JAMES) AND FINCH, LTD., Plymouth, chemical manufacturers. (M., 23/3/29.) Registered March 9, £12,000, £2,000 and £5,000 debenture stock dated June 3, 1901, August 26, 1902, and March 23, 1928, part of £25,000; charged on properties at Plymouth and Cwmbran, also general charge. *£4,000 debentures, £1,699 bank overdraft. December 22, 1928.

HORTON MANUFACTURING CO., LTD., Rickmansworth, liquid soap manufacturers. (M., 23/3/29.) Registered March 2, £500 debentures, balance of £4,000; general charge. *Nil. May 22, 1928.

RAINES AND PORTER, LTD., Hull, oil refiners. (M., 23/3/29.) Registered March 8, £22,500 charge, to Yorkshire Insurance Co., Ltd., York; charged on properties in Hull, etc. *£3,100. March 28, 1928.

London Gazette, &c.

Companies Winding Up Voluntarily

BURNDEN TAR CO. (BOLTON), LTD. (C.W.U.V., 23/3/29.) By reason of its liabilities, March 13. H. Horrocks, chartered accountant, 20, Chancery Lane, Bolton, Lancs, appointed as liquidator. Meeting of creditors at the, Pack Horse Hotel, Bradshawgate, Bolton, Thursday, March 28, at 3 p.m.

DAPPER DYES, LTD. (C.W.U.V., 23/3/29.) By reason of its liabilities, March 11. J. Meikle, accountant, 78, St. Vincent Street, Glasgow, appointed as liquidator. Meeting of creditors, Religious Institution Rooms, 200, Buchanan Street, Glasgow, Thursday, March 28, at 3 p.m.

PENDLETON'S PURE DRUG CO., LTD. (C.W.U.V., 23/3/29.) By reason of its liabilities, March 11. G. H. Black, chartered accountant, Central Chambers, Lumley Road, Skegness, appointed as liquidator. Meeting of creditors at liquidator's office, on Tuesday, March 26, at 3 p.m.

TRINIDAD AND BRITISH MAIKOP OIL, LTD. (C.W.U.V., 23/3/29.) By special resolution, February 26, confirmed March 14. H. J. Stephens, 20, Copthall Avenue, London, appointed as liquidator for the purpose of reconstruction.

Receivership

RADIUM MANUFACTURING CO., LTD. (R., 23/3/29.) M. G. Hacker, of 23, Surrey Street, W.C.2, was appointed Receiver and manager on March 8, under powers contained in debenture dated January 10, 1929.

New Companies Registered

MACLAURIN COAL PRODUCTS, LTD., 150, Hope Street, Glasgow.—Registered as a "public" company on March 14. Nominal capital, £60,000 in 30,000 7½% cumulative participating preference, and 30,000 ordinary shares of £1 each. Objects, to carry on the business of carbonizing or gasifying coal or other carbonaceous material, etc. Directors: G. Wink Wight, R. MacLaurin, J. P. Allan, Major F. T. F. Carr.

SURREY DRUG CO., LTD., Lavender Parade, London Road, Cheam.—Registered March 4. Nominal capital, £500 in £1 shares. Wholesale, retail, manufacturing, and dispensing chemists, druggists, drysalters, oil and colour men, etc. Directors: J. W. Carter and C. E. Wharton.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

CREOSOTE.—The South African Railways and Harbours Administration is calling for tenders, to be presented in South Africa by March 28, 1929, for the supply of 35,000 Imperial gallons of creosote (Tender No. 1428) (Reference B.X. 5161.)

LABORATORY EQUIPMENT, ETC.—New University Buildings are being planned for erection at Hamilton, Ontario, at an estimated cost of approximately 1,500,000 dollars. United Kingdom firms who are interested in this matter as providing possible opportunities for the supply of either equipment and apparatus for the use of the university students, or of materials, fittings, etc., required for the new buildings, may obtain further particulars. (Reference No. C.X.3003.)

Death of Dr. Paul Dvorkovitz

DR. PAUL DVORKOVITZ, one of the pioneers of the petroleum industry, and the originator of the Dvorkovitz system of low temperature carbonisation, died in Paris on Saturday, March 16, aged 72. Educated in the Medical Academy of Petrograd, he took his science degree at the University of Moscow, where he became assistant to Professor Markovnikoff. Liquid fuel was utilised for the first time under boilers at his instigation. He also introduced a method of using oil to enrich ordinary gas, and over 60,000,000 gallons of oil are used in this connection by the gas companies annually. For seven years he was adviser to the late Viscount Bearsted, and was associated with him in the foundation of the Shell Company. While he was on a visit to Russia in 1917 the Revolution broke out, and he was thrown into prison on account of his pro-British activities. In 1919, after frequent threats of execution, he was suddenly released, through the intervention of Maxim Gorky, conditional on his becoming chief adviser to the Central Mining Department. In 1921 he escaped and came to England, where, in spite of his age and the loss of his fortune, he devoted his energy to the low temperature carbonisation of coal, the possibilities of which he had outlined in a lecture before the Society of Chemical Industry as early as 1893. His system of low temperature carbonisation is now being developed by Motor Fuel Proprietary, Ltd.

